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Tertiary and Late Cretaceous Spores and Pollen from the Gippsland Basin, Southeastern Australia

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Abstract: The Gippsland Basin in southeastern Australia lies partly onshore but mainly offshore and contains a relatively thick sequence of dominantly non-marine strata. In the western inland portion, the section is represented by extensive Oligocene and Miocene coals of the Latrobe Valley Coal Measures, whereas in the coastal and offshore portions it consists mainly of Late Cretaceous through Eocene clastics and coals of the Latrobe Group. The abundant, diverse, and stratigraphically significant spores and pollen from these sections are the main subject of this paper. In all, 147 species are considered; this includes the description of the following 10 new form genera: *Anisotricolporites, Bysmapollis, Concolpites, Dryptopollenites, Gephyrapollenites, Helciporites, Herkosporites, Paripollis, Quadraplanus, Schizocolpus;* and 65 new form species which account for a substantial increase in the number of spore-pollen species identified from the Australian Tertiary. In addition, revised descriptions are provided and lectotypes or neotypes are selected for several previously described species, mostly proteaceous pollen. Based primarily on the ranges of the spores and pollen as determined in the Gippsland Basin, ten biostratigraphic zones are recognized. The diagnostic features of the Late Cretaceous through early Eocene offshore zones (*Nothofagidites senectus* through *Proteacidites asperopolus* Zones) are summarized; the middle to late Eocene Lower *Nothofagidites asperus* Zone is redefined on the basis of new information from onshore sections, and three new zones—the Upper *Nothofagidites asperus,* the *Proteacidites tuberculatus* and the *Triporopollenites bellus* Zones—are introduced to cover the latest Eocene through Miocene part of the section in the onshore portion of the basin.

INTRODUCTION

Tertiary palynology in southeastern Australia began in the mid-1940's with the publication on fossil *Nothofagus* (Southern beech) pollen by Cookson (1946) and on Oleacean (Olive family) pollen and megafossils, also by Cookson (1947). Between then and 1955, a series of short papers appeared in which different types of Australian fossil pollen and spores were described. For example, in 1950 Cookson described several species of fossil proteaceous pollen; fossil gymnosperm pollen were discussed by Cookson (1953) and by Cookson and Pike (1953, 1953, 1954) and numerous angiosperm pollen species were proposed by Cookson and Pike (1954). By and large, these publications as well as two later papers (Cookson 1957, 1959) emphasized the morphology of the forms and their similarity and possible affinity to the pollen and spores of Holocene plants.

Cookson's 1954 report on the spores and pollen from the V.M.D. Birregurra-1 bore in Victoria represented the first attempt in southeastern Australia to characterize, label, and use Tertiary spore pollen assemblages as a means for correlating surface and subsurface sections. She recognized three distinct spore-pollen assemblages in the Birregurra-1 bore which were designated in ascending order Microflora A (Cretaceous), Microflora B (Paleocene to early Eocene), and Microflora C (Eocene). About 25 spore-pollen species were reported from the two Tertiary assemblages and the occurrences of these species in similar assemblages from nearby Otway Basin surface sections were shown.

Subsequently, little was published on Australian Tertiary spore-pollen assemblages until the contribution by Harris (1965) on the sequence of spore-pollen assemblages in the Princetown area of Victoria between Dilwyn Cove and the mouth

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of the Gellibrand River. The oldest assemblage—the *Triorites edwardsii* (= *Gambierina edwardsii*) Assemblage—occurred in the Pebble Point Formation and the lower part of the Dilwyn Clay. This assemblage was dated as middle Paleocene and was considered in part equivalent to Cookson's Microflora B. The next youngest assemblage—the *Triorites edwardsii—Duplopollis orthoteichus* (= *Cupanieidites orthoteichus*) Concurrent Range assemblage occurred in the Rivernook member of the Dilwyn Clay and in the strata above the Rivernook member and below the *Turritella* Bed. This spore-pollen assemblage was interpreted as middle to late Paleocene and presumably came between Cookson's Microfloras B and C. Harris's youngest assemblage—the *Duplopollis orthoteichus* Assemblage—occurred in the section from the *Turritella* bed to the top of the fossiliferous section at Princetown, and includes the Princetown member. The assemblage was interpreted as late Paleocene and as being somewhat older than Cookson's Microflora C. Neither the top of the *Duplopollis orthoteichus* Assemblage nor the base of the *Triorites edwardsii* Assemblage were defined.

The status of Tertiary palynology at about the time the first offshore Gippsland Basin well (Barracouta-1) was drilled, which was also about the time that Harris's paper appeared was:

1. About 100 species of fossil spores and pollen were described from Paleocene through Pliocene samples.
2. The samples, for the most part, were from scattered, isolated localities with little stratigraphic control or continuity.
3. The ranges were undetermined for all but a very few species, and except for the publications on the Princetown area and the Birregurra-1 bore, the qualitative and quantitative composition of the spore-pollen assemblages were essentially unknown.
4. The sequential succession of assemblages and their spatial relationships had not been determined.

Since then, the characteristics of assemblages from western Victoria and eastern Southern Australia were elucidated by Harris (1971) and a considerable amount of new information on spore-pollen assemblages and their distribution in south-eastern Victoria became available from petroleum exploration wells in the offshore portion of the Gippsland Basin. More recently, Harris (1972) described and illustrated 16 new species from South Australia. At the present time, an estimated 250 to 300 species of fossil spores and pollen are known from Late Cretaceous through Miocene sections of the Gippsland Basin. Of these species, approximately 140 are stratigraphically important.

In 1971, Stover and Evans (ANZAAS Brisbane Congress, May 1971; manuscript submitted for publication in the Dr I. C. Cookson Memorial Volume, Geol. Soc. Australia Special Publication No. 4) presented the spore-pollen zonation for the offshore portion of the Gippsland Basin and illustrated a few of the diagnostic forms from each of the Zones. A short time later Partridge completed a study of the spore-pollen assemblages from the onshore portion of the basin (Partridge, 1971, M.Sc. Thesis) in which he recognized and defined additional zones. A comparatively large number of undescribed spore and pollen species, of which the majority have stratigraphic significance, were discovered in assemblages from offshore and onshore sections, and because most of the new forms occur in both portions of the basin, it is appropriate that they be introduced in a single publication. The purposes of this paper, then, are to describe, illustrate, and discuss the spore-pollen species from Late Cretaceous through Miocene assemblages of the Gippsland Basin, to indicate their ranges, and formally to present the zonation for the onshore portion.

The Gippsland spore-pollen zonation resulted from the examination of approximately 800 conventional and sidewall cores from offshore wells and an additional 130 samples from onshore wells and coal localities. Locations of the offshore wells are shown in Stover and Evans (1973) and Fig. 1 shows the locations of the onshore wells and surface localities, and those offshore wells from which type specimens of species described herein were selected. More precise locality data are presented in the register of localities and specimens at the end of the paper.

This spore-pollen zonation is most applicable in dominantly non-marine and marginal marine sections. The Late Cretaceous through Eocene zones are found mainly in the offshore portion of the basin where they are developed and documented best in the Latrobe Group. This group contains quartzose sandstones, coals, mudstones, siltstones and shales, and attains an estimated maximum thickness of 15,000 ft in the basin deep (James & Evans, 1971). The Latrobe Group is overlain unconformably by marine Oligocene strata which, in turn, are overlain conformably by Miocene and possibly younger Tertiary and Quaternary rocks. The Oligocene and Miocene spore-pollen zones are developed and documented best in the onshore portion of the basin and are expressed most favorably in the Latrobe Valley Coal Measure (Gloe, 1967). This group, which occurs in the Latrobe Valley where it reaches a maximum thickness of

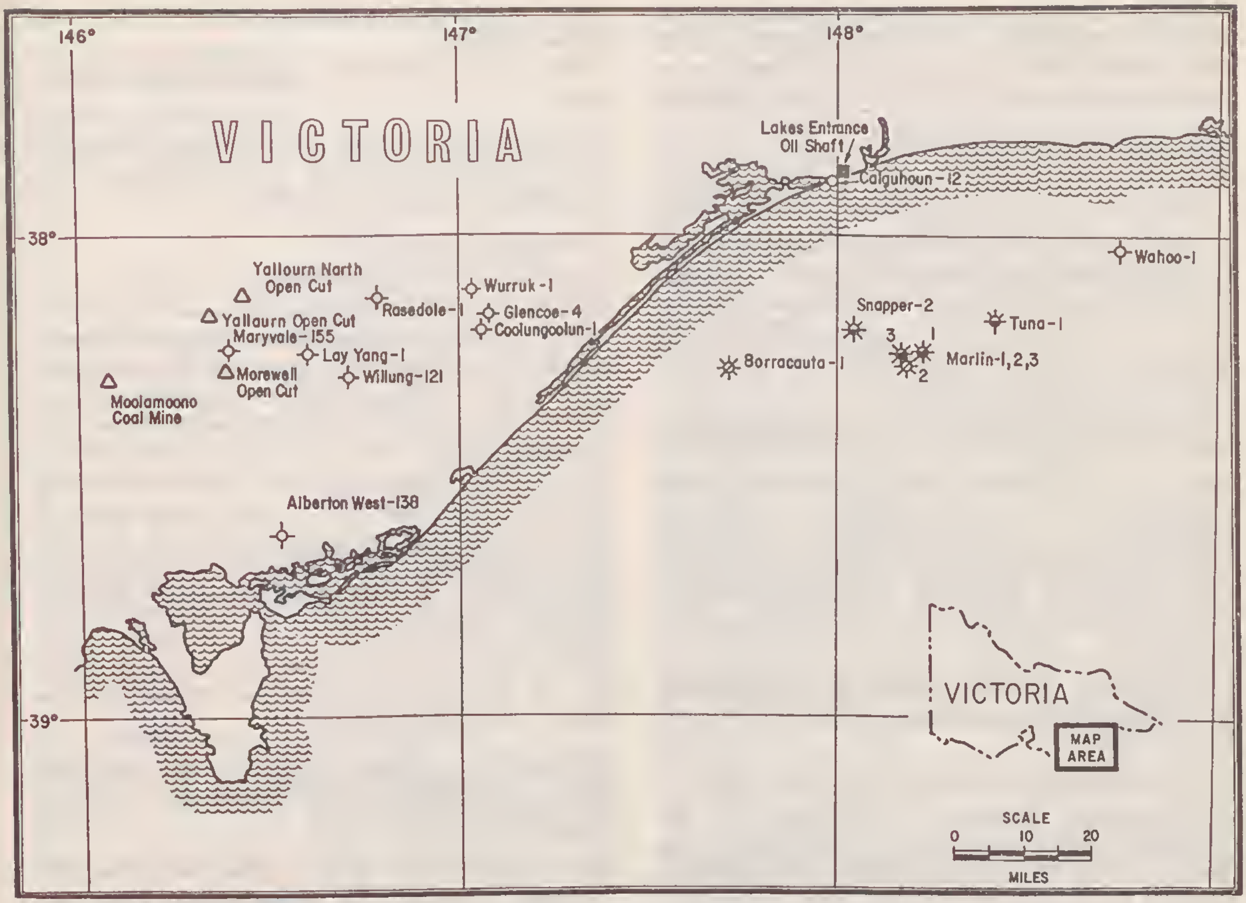

FIG. 1—Location Map.

more than 2000 ft, is dominated by thick brown coal seams in the upper part and by interbedded sandstones, clays, coals and volcanics in the lower part. Middle and late Eocene zones are developed better in the onshore sections in the lower part of the Latrobe Valley Coal Measures.

SPORE-POLLEN ZONES

The following biostratigraphic Zones are recognized in the Late Cretaceous and Tertiary sections of the Gippsland Basin:

Triporopollenites bellus Zone—late Miocene, possibly into Pliocene.

Proteacidites tuberculatus Zone—early Oligocene into early Miocene.

Upper *Nothofagidites asperus* Zone—late Eocene into early Oligocene.

Lower *Nothofagidites asperus* Zone—middle Eocene to late Eocene.

Proteacidites asperopolus Zone—early Eocene.

Malvacipollis diversus Zone—early Eocene.

Lygistepollenites balmei Zone—middle and late Paleocene.

Tricolpites longus Zone—early Paleocene, possibly into middle Paleocene.

Tricolporites lilliei Zone—Late Cretaceous (Maastrichtian equivalent).

Nothofagidites senectus Zone—Late Cretaceous (Senonian equivalent).

Because the criteria for the recognition of each Zone from the *Nothofagidites senectus* through the *Proteacidites asperopolus* Zones are given in Stover and Evans (1973), only the major features of these Zones are given below. A more complete discussion of the Lower *Nothofagidites asperus* Zone which takes into account information from onshore sections is presented, as well as discussions on the Zones proposed in this paper. The accompanying stratigraphic chart (Fig. 3) shows the ranges of the species described here and of selected previously described species. Modifications in the ranges of some forms were necessary and the information depicted on Fig. 3 supersedes that given in Stover and Evans (1973). Throughout author and date citations are given only for those species excluded in the descriptive paleontology section.

Nothofagidites senectus ZONE

DIAGNOSTIC FEATURES: Base is defined by the introduction of *Nothofagidites* pollen of the *brassi* group including the nominate species, *N. senectus*, in association with *Gambierina rudata, Proteacidites amolosexinus, Tricolpites gillii* and *T. sabulosus*. Top is marked by the first appearance of *Tricolporites lilliei* together with other species indicative of the *T. lilliei* Zone.

ASSOCIATED FORMS: Mainly long-ranging species such as *Laevigatosporites ovatus* Wilson & Webster 1946, *Cyathidites minor* Couper 1953, *Lycopodiumsporites austroclavitidites* (Cookson) Potonié 1956, *Cicatricosisporites australiensis* (Cookson) Potonié 1956, *Gleicheniidites circinidites* (Cookson) Dettmann 1963, *Microcachyridites antarticus* Cookson 1947 and *Phyllocladidites mawsonii*.

OCCURRENCE: Offshore portion of the Gippsland Basin with reference sections given by Stover and Evans (1973).

AGE: Late Cretaceous (Senonian equivalent).

CORRELATIVES: Probably a correlative of the *Tricolpites pachyexinus* Zone and certainly of the lower part of the *Nothofagidites* Microflora interval in the Otway Basin (Dettmann & Playford, 1969).

Tricolporites lilliei ZONE

DIAGNOSTIC FEATURES: Base is defined by the nearly simultaneous initial occurrence of *Gephyrapollenites wahooensis, Latrobosporites amplus, L. ohaiensis, Lygistepollenites balmei, Nothofagidites endurus, Ornamentifera sentosa, Proteacidites palisadus, P. scaboratus* Couper 1960, *Tricolpites confessus, Triporopollenites sectilis* and the nominate species. *Tricolpites. sabulosus* terminates within the Zone, whereas *Gambierina edwardsii, Lygistepollenites florinii, Phyllocladidites verrucosus, Quadraplanus brossus, Simplicepollis meridianus, Stereisporites regium* and *Tricolpites longus* appear within the Zone, mostly in the uppermost part. Top is marked by the introduction of species indicative of the *Tricolpites longus* Zone.

OTHER FEATURES: Increase in the relative abundance of *Nothofagidites* spp. and a greater diversity of angiosperm pollen than found in the *N. senectus* Zone.

OCCURRENCE: Offshore portion of the Gippsland Basin with reference sections given by Stover and Evans (1973).

AGE: Late Cretaceous (Maastrichtian equivalent).

CORRELATIVES: Upper part of the *Nothofagidites* Microflora interval in the Otway Basin (Dettmann & Playford, 1969).

Tricolpites longus ZONE

DIAGNOSTIC FEATURES: Base is defined by the introduction of *Dilwynites granulatus, Latrobosporites crassus, Proteacidites angulatus, Stereisporites (Tripunctisporis)* spp. and *Tetracolporites verrucosus*. The ranges of *Nothofagidites senectus, Proteacidites palisadus* and *P. amolosexinus* terminate whereas those of *Australopollis obscurus, Ilexpollenites anguloclavatus* begin within the Zone. Species recorded last at or near the top of the Zone are *Latrobosporites amplus, Quadraplanus brossus, Tricolpites confessus, Tricolporites lilliei, Triporopollenites sectilis* and the nominate species.

OTHER FEATURES: Absence or very low number of *Nothofagidites* spp. and common occurrence of *Gambierina* spp.

OCCURRENCE: Offshore portion of the Gippsland Basin with reference sections given by Stover and Evans (1973).

AGE: Early to possibly middle Paleocene; the boundary between the *Tricolporites lilliei* and *Tricolpites longus* Zones approximates the Mesozoic—Tertiary boundary.

CORRELATIVES: None known in southeastern Australia.

Lygistepollenites balmei ZONE

DIAGNOSTIC FEATURES: Base is defined by the earliest and nearly coincident appearance of *Haloragacidites harrisii, Herkosporites elliottii, Nothofagidites brachyspinulosus, Peromonolites densus, P. vellosus, Phyllocladidites reticulosaccatus, Polycolpites langstonii, Rugulatisporites mallatus* and *Tricolpites phillipsii*. Top of the Zone is marked by the essentially simultaneous last occurrence of *Australopollis obscurus, Ceratosporites equalis* Cookson & Dettmann 1958, *Gambierina rudata, Lygistepollenites ellipticus, Phyllocladidites reticulosaccatus, P. verrucosus, Polycolpites langstonii* and the nominate species.

OTHER FEATURES: Introduction of species particularly in the upper part with some species terminating below the top of the Zone. Listed below are species whose ranges end (Column A) or begin (Column B) in this Zone.

COLUMN A

Gambierina edwardsii
Latrobosporites ohaiensis
Ornamentifera sentosa
Proteacidites angulatus
Stereisporites regium
Tetracolporites verrucosus

COLUMN B

Banksieaeidites elongatus
Myrtaceidites mesonesus/ parvus
Nothofagidites flemingii
Parvisaccites catastus
Proteacidites adenanthoides
P. annularis
P. incurvatus
P. tenuiexinus

OCCURRENCE: Widespread in offshore portion of Gippsland Basin (Stover and Evans 1973); with equivalents probably present in the southwest onshore portion of the basin, based on the spore pollen lists given in Cookson & Dettmann (1959) and Traill (1968).

AGE: Middle and late Paleocene.

CORRELATIVES: *Gambierina edwardsii* Zonule of Harris (1971) is in part equivalent, and probably most of the localities referred to Microflora B by Cookson (1954).

Malvacipollis diversus ZONE

DIAGNOSTIC FEATURES: Base is defined by the first appearance of *Banksieaeidites arcuatus, Cupanieidites major/orthoteichus, Intratriporopollenites notabilis, Liliacidites lanceolatus, Polycolpites esobalteus, Proteacidites grandis, P. leightonii, Schizocolpus marlinensis, Spinizonocolpites prominatus* and *Verrucosisporites kopukuensis.* Top of the Zone is indicated by the introduction of species diagnostic of the overlaying *Proteacidites asperopolus* Zone and by quantitative changes in the assemblages explained in the presentation of the *P. asperopolus* Zone.

OTHER FEATURES: A large number of species appear within the Zone of which the majority occur sporadically in the lower and middle part of the Zone and consistently in the upper part. These include, in addition to those shown in Fig. 3, *Anacolosidites acutullus, A. luteoides, Beaupreaidites elegansiformis, Kuylisporites waterbolkii, Milfordia homeopunctata, Proteacidites kopiensis, P. latrobensis, P. obscurus, P. reticuloscabratus* and *P. tuberculiformis.* Toward the top of the Zone another group of species appears which are typically more common in younger Zones. These include *Dryptopollenites semilunatus, Ericipites crassiexinus, Nothofagidites deminutus, N. goniatus, N. heterus, Proteacidites asperopolus, P. reticulatus* and *Santalumidites cainozoicus.* Only *Latrobosporites crassus, Nothofagidites endurus* and *Tricolpites gillii* terminate within the *Malvacipollis diversus* Zone.

OCCURRENCE: Fairly widespread in the offshore portion of the Gippsland Basin with reference sections given by Stover and Evans (1973).

AGE: Early Eocene.

CORRELATIVES: The Otway Basin *Cupanieidites orthoteichus* Zonule of Harris (1971) is in part equivalent to the *Malvacipollis diversus* Zone.

Proteacidites asperopolus ZONE

DIAGNOSTIC FEATURES: Base is defined by the initial occurrence of *Bombacacidites bombaxoides, Helciporites astrus, Liliacidites bainii, Myrtaceidites verrucosus, Proteacidites crassus* and *Sapotaceoidaepollenites rotundus.* Zone is also characterized by the relatively high abundance of *Proteacidites asperopolus* and/or *P. pachypolus* (6% to 14%) and by *Haloragacidites harrisii* being more abundant than *Nothofagidites* spp. The relative abundance of *H. harrisii* to *Nothofagidites* spp. tends to be greatest in the lower part of the Zone with the difference in the relative abundance of the two pollen types diminishing gradually towards the top of the Zone. Top is delimited by the essentially contemporaneous termination of *Intratriporopollenites notabilis, Malvacipollis diversus, Myrtaceidites tenuis, Proteacidites grandis,* and *P. ornatus.*

OCCURRENCE: Offshore portion of the Gippsland Basin with reference sections given by Stover and Evans (1973).

AGE: Early Eocene.

CORRELATIVES: The *Proteacidites confragosus* Zonule of Harris (1971) from the western Gambier embayment is possibly a correlative of the *Proteacidites asperopolus* Zone.

LOWER **Nothofagidites asperus** ZONE

The base of the Lower *Nothofagidites asperus* Zone was defined by Stover and Evans (1973) from offshore sections and because of the unconformity at the top of the Latrobe Group they were unable to propose palynologic criteria for the recognition of the upper boundary. The part of the Zone equivalent to the interval missing in offshore sections, was identified by Partridge (1971) in onshore wells, where the top of the Zone can also be seen expressed in a non-marine sequence. Consequently, it is now possible not only to define the top but also to submit a more complete description of the Zone.

DIAGNOSTIC FEATURES: The base of the Zone is defined by the first appearance of 15 species listed below. Of these, the seven designated by asterisks are found only in the Lower *Nothofagidites asperus* Zone.

**Anisotricolporites triplaxis*
Foveotriletes balteus
**Gemmatricolporites gestus*
Gothanipollis bassensis
Nothofagidites asperus
Nothofagidites falcatus
Nothofagidites vansteenisii
Periporopollenites vesicus
**Proteacidites recavus*
**Proteacidites reflexus*
Rugulatisporites trophus
**Tricolpites simatus*
**Tricolpites thomasii*
**Tricolporites angurium*
Tricolporites leuros

Equally diagnostic of the base of the Zone is the preponderance of *Nothofagidites* specimens in the assemblage. In addition, practically all of the species of *Nothofagidites* described by Cookson (1946, 1959) are represented. Owing to the drastic increase in *Nothofagidites*, there is a sharp reversal in the ratio of specimens of *Haloragacidites harrisii* to those of *Nothofagidites* spp. Because many of the species that begin in the Lower *Nothofagidites asperus* Zone are sparse or rare at the beginning of their ranges or in marginal marine sections, the '*harrisii* reversal' affords a quantitative means for recognizing the base of the Zone.

An impressive number of species have their final occurrences at or near the top of the Zone. These include: 1, most of the species whose ranges are confined to the Lower *Nothofagidites asperus* Zone; 2, the species listed on Fig. 3 whose ranges are shown as stopping at the top of the Lower *N. asperus* Zone and 3, the following additional forms: *Proteacidites adenanthoides, P. crassus, P. latrobensis, P. reticulatus, P. reticuloscabratus, P. tuberculiformis, Simplicepollis meridianus* and *Tricolporites scabratus.*

OTHER FEATURES: Within the Lower *Nothofagidites asperus* Zone thirteen additional species appear. These are listed in Column A, given below. The first eight species listed occur nearly simultaneously and before the last five species listed. Prior to the incoming of the first eight forms in Column A the species listed in column B, also given below, complete their vertical ranges. Based on the termination of these species plus the subsequent introduction of the species listed in Column A, the Lower *N. asperus* Zone can be divided locally into an upper and lower Subzone. Because the regional distribution of the Subzones has yet to be demonstrated, no formal names for them are proposed.

COLUMN A

Aglaoreidia qualumis
Anacolosidites sectus
Gephyrapollenites calathus
Paripollis ochesis
Polycolpites reticulatus
Proteacidites stipplatus
Tricolporites sphaerica
Triorites magnificus
Foveotriletes palaequetrus
Proteacidites rectomarginis
Tricolporites retequetrus
Triporopollenites chnosus
Verrucosisporites cristatus

COLUMN B

Anacolosidites acutullus
A. luteoides
Dryptopollenites semilunatus
Liliacidites bainii
Proteacidites alveolatus
P. asperopolus
P. incurvatus
P. kopiensis
P. pachypolus
P. tenuiexinus
Schizocolpus marlinensis
Spinizonocolpites prominatus
Tricolpites incisus

COLUMN A: species that appear within the Lower *N. asperus* Zone.
COLUMN B: species that terminate within the Lower *N. asperus* Zone.

DISCUSSION: Although angiosperm pollen dominate palynomorph assemblages from the Lower *Nothofagidites asperus* Zone there is generally a slight increase in the relative abundance of gymnosperm pollen in this Zone over that in the preceding Zone. Among the angiosperm pollen the most conspicuous features are 1, the increased abundance of *Nothofagidites* spp., 2, the continual decrease in the prevalence of proteaceous pollen and 3, the greater diversity of small, generally anguloaperturate pollen such as *Gothanipollis bassensis, Tricolpites thomasii* and *T. simatus.* Considerable preservational and compositional differences are seen among the spore-pollen assemblages from this Zone—more so than in any of the older Zones. In preservation, abundance and diversity the best assemblages are from the onshore sections and each of these conditions becomes poorer or decreases in offshore wells. There is, however, an increase in the amount of microplankton in assemblages from offshore sections.

OCCURRENCE: Onshore and offshore portions of the Gippsland Basin, and in the former the Zone is typically developed in Wurruck-1 well between 2898 and 3023 ft.

AGE: Middle and late Eocene.

CORRELATIVES: The *Proteacidites pachypolus* and *Triorites magnificus* Zonules of Harris (1971) are considered equivalent to this zone.

UPPER **Nothofagidites asperus** ZONE

DIAGNOSTIC FEATURES: The Zone occupies the interval between the last occurrence of *Triorites magnificus* as well as the other species whose ranges end at the top of the Lower *Nothofagidites asperus* Zone, and the first occurrence of *Cyatheacidites annulatus*. The Zone is characterized by *Proteacidites stipplatus*, which is rare in the underlying Zone but is the dominant species of *Proteacidites* in samples from this Zone, plus the first appearance of the species *Granodiporites nebulosus* and *Proteacidites tuberculatus*.

OTHER FEATURES: An increase in the frequency of occurrence of *Aglaoreidia qualumis*, *Proteacidites rectomarginis* and the last appearance of specimens of *Stereisporites (Tripunctisporis)* spp.

DISCUSSION: This Zone represents a transition assemblage between typical Eocene and Oligocene assemblages. The diversity of species in this Zone is low when compared with the other Zones, and most of the species recorded are long ranging Eocene to Oligocene forms. Also the spore-pollen assemblages obtained from clastic sediments are very similar to the assemblages obtained from the coals in this Zone, whereas in other Zones the clastic strata yield more diverse assemblages than the associated coals. This may be in part a reflection of the lithologies in this interval which consist predominantly of sands and thick coal seams. Some of the coal assemblages are unusual in containing very high percentages of specimens of *Phyllocladidites mawsonii* (more than 80%).

OCCURRENCE: Onshore portion of the Gippsland Basin; assemblages indicative of this Zone occur in Wurruk-1 well between 2367 and 2817 ft.

AGE: Late Eocene into early Oligocene.

CORRELATIVES: The Zone is regarded as equivalent to Taylor's (1966) planktonic foraminiferal Zonule K and the lower part of Zonule J.

Proteacidites tuberculatus ZONE

DIAGNOSTIC FEATURES: The base of the Zone is defined by the first appearance of *Cyatheacidites annulatus* and *Foveotriletes crater*; the top is marked by the last occurrence of *Foveotriletes palaequetrus*, *Kuylisporites waterbolkii* and *Tricolporites retequetrus* and the absence of species indicative of the overlying *Triporopollenites bellus* Zone.

OTHER FEATURES: Approximately 20 spore-pollen species have their last occurrence within this Zone, and based on these extinctions, a tripartite subdivision can be recognized locally. Because the subdivisions are determined by species terminations, without the sequential introduction of a meaningful number of species in successive intervals, no formal nomenclature for the subdivisions is proposed. Moreover, the six species that do appear within the *Proteacidites tuberculatus* Zone are sparse or rare. Distribution of forms whose ranges begin or end within this Zone are shown in Fig. 2.

Assemblages from the base of the *Proteacidites tuberculatus* Zone are further characterized by the consistent and frequently common occurrence of *Proteacidites rectomarginis*, *Foveotriletes crater*, *Verrucosisporites cristatus* and the nominate species. *Myrteacidites eucalyptoides* Cookson & Pike 1954 and *Chenopodopollis* spp. are first recorded from this part of the Zone, where they are rare. *Foveotriletes lacunosus* and *Cyathidites subtilis*, which occur initially and usually together in the middle subdivision, are also rare and *C. subtilis*, although distinctive, can be easily misidentified or overlooked. In the upper subdivision is recorded the first appearance of *Polyadopollenites myriosporites* and *Psilastephanocolporites micus*. These species are of uncertain stratigraphic value; the former because it is extremely rare, whereas the latter appears to be a facies fossil occurring almost exclusively in coals.

OCCURRENCE: Onshore portion of the Gippsland Basin; in the Latrobe Valley the Zone occurs in the clay below the Morwell No. 2 seam up into the Morwell No. 1A seam approximately 170 ft above the clay split between Morwell No. 1A and No. 1B seams.

AGE: Early Oligocene through early Miocene.

CORRELATIVES: The base of the zone is in the upper part of Taylor's (1966) planktonic foraminiferal Zonule J and the top is equated to the boundary between Zonules E and F, that is, the early-late Miocene boundary. The top of the

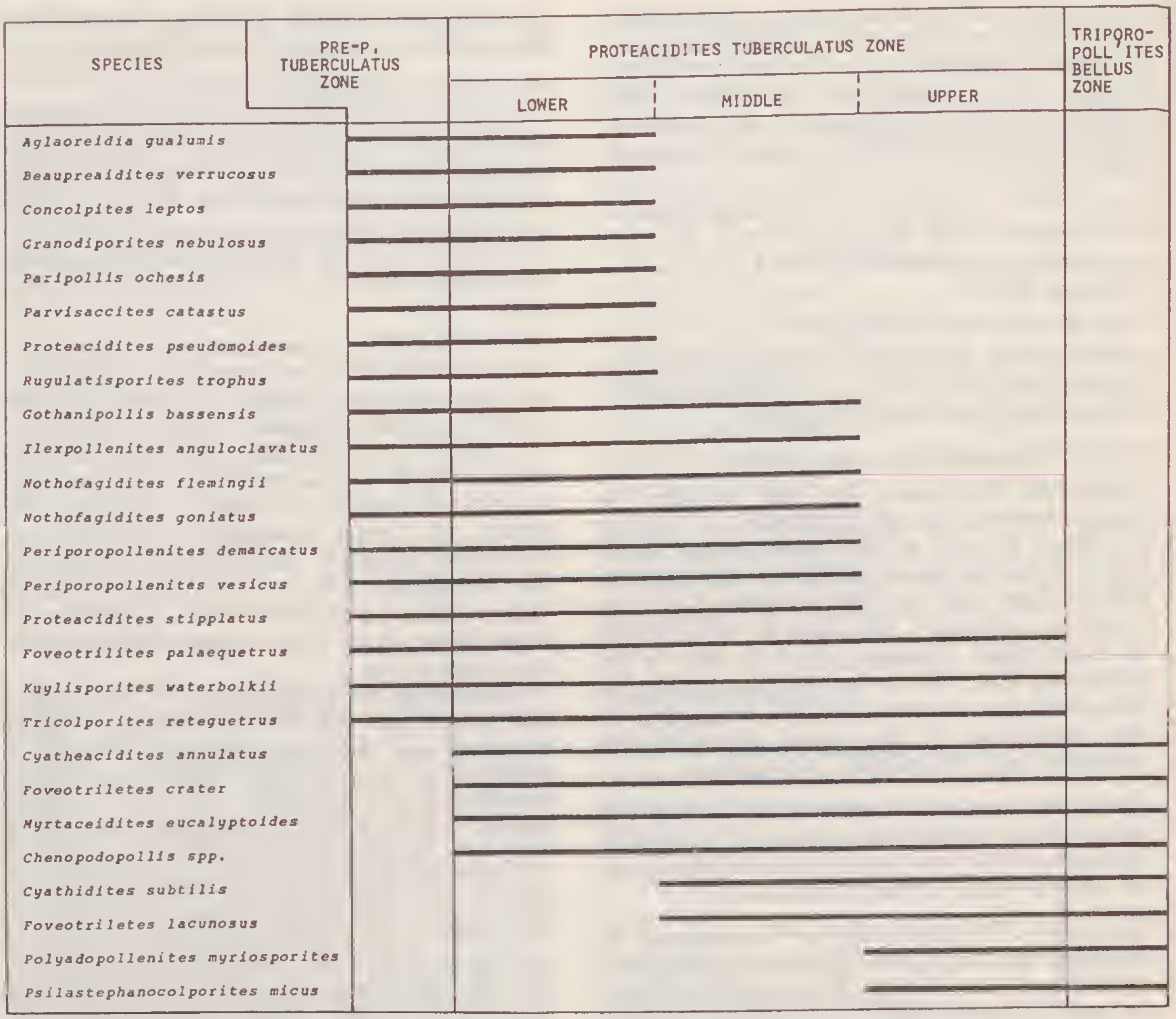

FIG. 2—Distribution of selected spore-pollen species within the *Proteacidites tuberculatus* Zone.

middle subdivision of the *Proteacidites tuberculatus* Zone approximates the Oligocene—Miocene boundary.

Triporopollenites bellus ZONE

DIAGNOSTIC FEATURES: The base of the Zone is defined by the first appearance of the nominate species and of *Polypodiaceoisporites tumulatus, Proteacidites symphyonemoides, Rugulatisporites micraulaxus, Symplocoipollenites austellus* and *Tubulifloridites antipodica*. The top is inadequately defined palynologically, but is provisionally taken as the first appearance of *Haloragacidites amolosus*, which also corresponds to a marked decrease in the abundance of *Nothofagidites* specimens.

OTHER FEATURES: Species characteristic of the *Triporopollenites bellus* Zone because of their general increase in abundance are *Milfordia homeopunctata, Gephyrapollenites calathus* and *Myrtaceidites eucalyptoides*. The ranges of *Herkosporites elliottii* and *Proteacidites rectomarginis* end whereas the range of *Haloragacidites haloragoides* begins within the Zone.

DISCUSSION: Specimens of *Nothofagidites* spp. are still abundant in the lower part of the Zone, and become gradually less common and are represented by fewer species towards the top. Gymnosperm pollen are also less diverse and abundant than in the *Proteacidites tuberculatus* Zone; in contrast, angiosperm pollen increase slightly in diversity, especially tricolporate forms and those of *Myrtaceidites* spp.

OCCURRENCE: Onshore portion of the Gippsland

Basin. Localities at which the Zone has been identified include the Yallourn Open Cut from the clay at the floor of the cut to 80 ft above the clay and Wurruk-1 well from 426 to 888 ft.

AGE: Late Miocene, possibly into Pliocene.

CORRELATIVES: The *Triporopollenites bellus* Zone is equivalent to the interval covered by Taylor's (1966) planktonic foraminiferal Zonules E through B and possibly Zonule A.

SUMMARY

Palynologically, no other Late Cretaceous through Miocene section in Australia has been studied as completely and in such detail as that in the Gippsland Basin. Within the approximately 7000 feet of non-marine strata comprising the Latrobe Group and the Latrobe Valley Coal Measures, ten biostratigraphic Zones are recognized. These include the six Zones delimited by Stover & Evans (1973) plus the Lower *Nothofagidites asperus*, Upper *Nothofagidites asperus*, *Proteacidites tuberculatus* and *Triporopollenites bellus* Zones. The zonation expresses an essentially uninterrupted though gradually changing sequence of palynologic assemblages and is based on the vertical ranges of about 150 spore-pollen species and on the compositional consistency of the palynomorph assemblages from each Zone. The ranges of the 65 new species described in this paper together with an additional 35 previously described forms are shown on Fig. 3. This range chart emphasizes the species most useful for subdividing the middle Eocene through Miocene section and is, therefore, supplemental to the range chart in Stover & Evans (1973) which stressed those species of stratigraphic importance in the Late Cretaceous through early Eocene.

The Late Cretaceous and Tertiary spore-pollen zonation for the Gippsland Basin coupled with those for the Early Cretaceous (Dettmann, 1963; Evans, 1966) and for the Late Cretaceous (Dettmann & Playford, 1969) afford a biostratigraphic framework for southeastern Australia covering a substantial portion of the stratigraphic column. Just as the zonations for the Cretaceous have proved invaluable for identifying, dating and interpreting comparable sections in other basins, it is anticipated that the Gippsland Basin zonation will prove equally relevant in nearby basins, and at the very least will serve as a comparison or reference section for future palynologic studies of Tertiary intervals in more distant regions. Undoubtedly, many of the species described and illustrated in the next section will be found in other basins, and as more information on the geographic distribution and the stratigraphic occurrences of these forms becomes available, a better understanding of the Tertiary palynology of Australia will emerge.

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DESCRIPTIVE PALYNOLOGY

This section presents the descriptions for ten new form genera and sixty-five new form species together with selected synonymies, revised descriptions and comments on previously described species. Stratigraphic ranges given for each species are those for the Gippsland Basin only. The locations of holotypes, neotypes and lectotypes are included with the descriptions; those for paratype and hypotypes are given in the Register of Illustrated Specimens at the end of the paper. Type specimens for many of the species described before 1955 were never designated and because the preparations containing practically all of the illustrated specimens have been located recently lectotypes are selected for those species dealt with here and some are re-illustrated. The 'P' numbers given for all the illustrated specimens and for the lectotypes designated without illustration in the text are those of the palaeontological collections in the National Museum of Victoria, Melbourne.

Trilete Spores

Genus **Baculatisporites** Thomson & Pflug 1953
Baculatisporites disconformis Stover, n. sp.
(Pl. 13, fig. 8)

DESCRIPTION: Amb circular to subcircular, commonly modified by folding. Spore wall slightly less than 1 μ

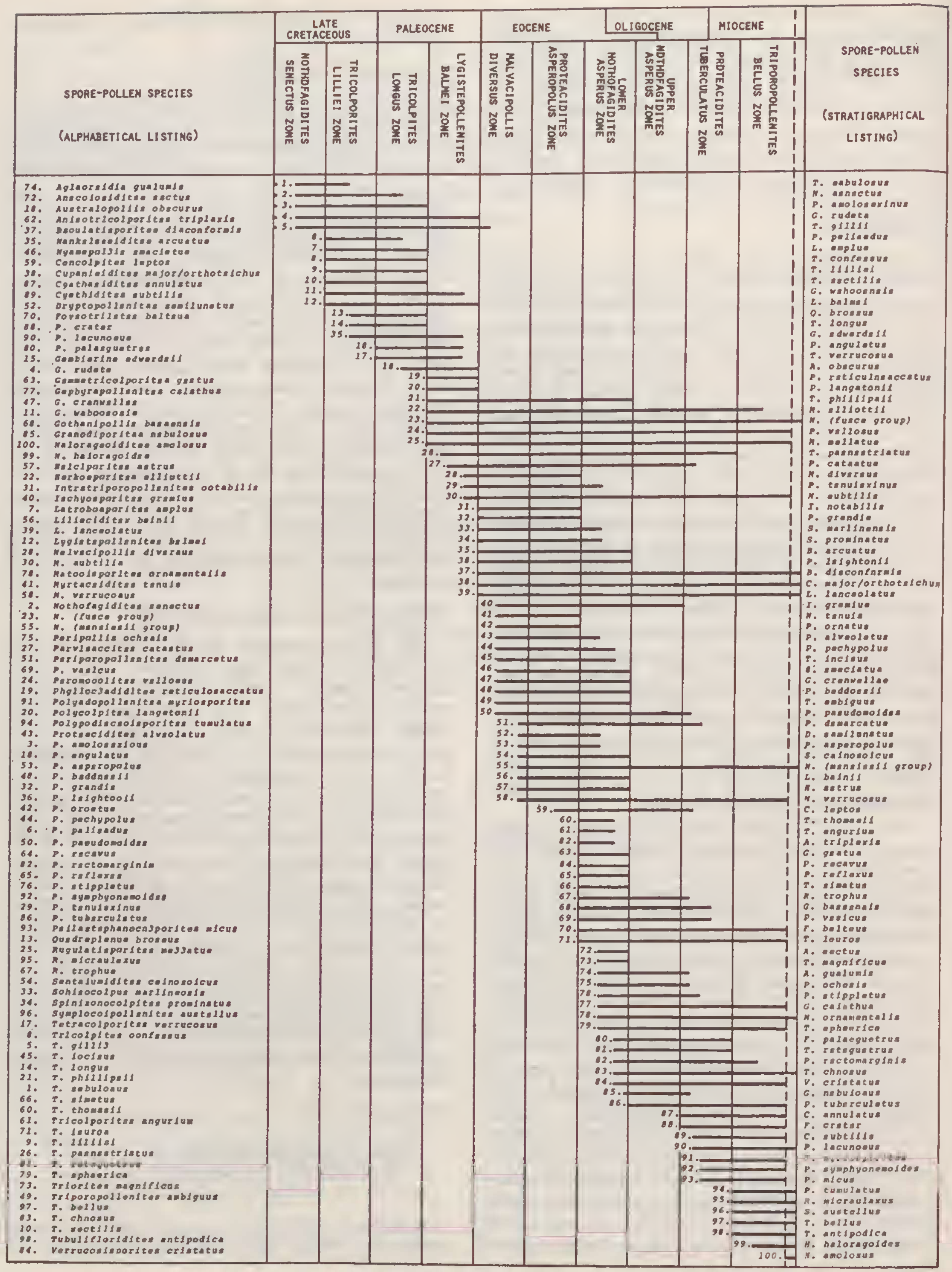

FIG. 3—Ranges of selected spore-pollen species in the Gippsland Basin.

thick, ornamented with discrete or fused, irregularly shaped protruberances 1 to 2 μ high, circular, roundly polygonal or sinuously elongate in plan view, length varies from 1 to 2·5 μ for individual projections, up to 9 μ for fused projections. Trilete rays 20 to 25 μ long, may be bordered by low, narrow, irregular marginal ridges. Diameter 40 (50) 55 μ based on 12 favorably oriented specimens.

COMPARISON: *Baculatisporites disconformis* differs from *B. comaumensis* (Cookson) Potonié 1956 by having generally larger, mainly non-equidimensional projections and a greater proportion of fused projections which in small areas tend to form short ridge-like structures. In *B. comaumensis* the ornamentation consists of equidimensional bacula and a few setae and clavae that are separate and randomly disposed.

HOLOTYPE: Specimen on slide P28050, 53 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 4648 ft, *Malvacipollis diversus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through *Triporopollenites bellus* Zone, early Eocene through Miocene.

REMARKS: Considerable variability was observed in the size, shape, density and distribution of the projections and, of course, in the outline of the spores because of folding. A large number of specimens were split, most frequently at the ends of the trilete rays.

Genus **Cyatheacidites** Cookson 1947 emended Partridge

1947 *Trilites (Cyatheacidites)* Cookson, p. 136.

TYPE SPECIES: *Cyatheacidites annulatus* Cookson 1947, designated by Potonié (1956, p. 62).

DIAGNOSIS (Emended): Spores trilete, cingulate, spore wall two layered; inner layer thin, attached proximally and equatorially, separated distally from thick outer wall layer. Proximal surface with various positive types of ornamentation which coalesce adjacent to the trilete rays to form flat contact areas.

COMPARISON: Potonié (1956) and Krutzsch (1959, 1967) compared *Cyatheacidites* to *Cingulatisporites* Thomson 1953, to *Polypodiaceoisporites* Potonié 1951 and to *Densoisporites* Weyland & Krieger 1953. *Cyatheacidites* differs from the first two by having the two wall layers separated distally and from the last by having the inner wall layer appressed equatorially as well as proximally.

Cyatheacidites annulatus Cookson 1947
(Pl. 13, figs. 5, 6)

1947 *Trilites (Cyatheacidites annulatus)* Cookson p. 153, Pl. 15, figs. 53-55.
1957 *Cyathea annulata* (Cookson) Cookson, p. 45, Pl. 9, figs. 4, 5.
1967 *Cyatheacidites annulatus* Cookson, Cookson & Cranwell, p. 208, Pl. 3, figs. 7, 8.
1969 ————, Cookson Fasola, p. 12, Pl. 2, fig. 3.

DESCRIPTION (Revised): Amb subcircular to subtriangular, apices broadly rounded; distal surface moderately convex, proximal surface flat to shallowly pyramidal. Spore wall two layered, inner layer 1 to 2 μ thick, separated distally from outer layer, latter 3 to 5 μ thick, distal surface with circular or irregularly shaped flat based foveolae or fossulae which may form a negative reticulum. Proximal surface granulate to verrucate, ornamentation coalesced adjacent to trilete rays to form flat, delicately foveolate to fossulate contact areas of variable size and shape. Cingulum psilate, 1/5 to 1/4 spore radius in width, outer margin smooth to irregular, profile semicircular. Dimensions, 35 (56) 65 μ in diameter, 28 specimens measured.

STRATIGRAPHIC RANGE: *Proteacidites tuberculatus* Zone through the *Triporopollenites bellus* Zone, early Oligocene through Miocene. Cookson (1957) reports *C. annulatus* from the Pliocene of Queensland; Cookson & Cranwell (1967) and Fasola (1969) record it from the Eocene of Chile.

Genus **Cyathidites** Couper 1953
Cyathidites subtilis Partridge, n. sp.
(Pl. 13, figs. 1, 2)

DESCRIPTION: Amb triangular, apices broadly rounded, sides straight to slightly concave, outline biconvex in equatorial view. Trilete rays extend to apices or nearly so. Spore wall 1 to 2·5 μ, granulate, granulae up to 1 μ in diameter, dense, area covered by granulae greater than intervening area so that spore wall may appear reticulate at focus levels near or at the bases of the granulae. Dimensions, 22 (35) 44 μ in diameter, 26 specimens measured.

COMPARISON: *Cyathidites subtilis* differs from *C. minor* Couper 1953 by having a granulate rather than a psilate spore wall.

HOLOTYPE: Specimen on slide P29714, 38 μ in diameter.

TYPE LOCALITY AND STRATA: Lakes Entrance Oil Shaft at 352 ft, Gippsland Limestone, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: Just above the base of the *Proteacidites tuberculatus* Zone and through the *Triporopollenites bellus* Zone, late Oligocene through Miocene.

Genus **Foveotriletes** van der Hammen ex Potonié 1956
Foveotriletes balteus Partridge, n. sp.
(Pl. 14, fig. 7)

DESCRIPTION: Amb convexly triangular, apices narrowly rounded, distal surface moderately convex, proximal surface pyramidal. Trilete rays extend nearly to spore margin, lips narrow, up to 3 μ in height. Proximal surface with concave folds (kyrtome) between trilete rays, folds continue around equatorial ends of trilete. Spore wall 1·5 to 2 μ interradially, up to 3 μ at apices. Surface foveolate, foveolae circular to elliptical, occasionally coalesced to form short, curved fossulae on distal surface where foveolae tend to be denser, foveolae least developed adjacent to trilete. Dimensions, 29 (43) 50 μ in diameter, 14 specimens measured.

COMPARISON: *Foveotriletes balteus* differs from *F. lacunosus* Partridge (this paper) by being larger, and by having a thicker spore wall, and a kyrtome developed around the trilete.

HOLOTYPE: Specimen on slide P29828. 50 μ in diameter.

TYPE LOCALITY AND STRATA: Rosedale-1 well, core 13 at 1854-1857 ft, *Proteacidites tuberculatus* Zone, early Oligocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone through *Triporopollenites bellus* Zone, middle Eocene through Miocene.

Foveotriletes crater Partridge n. sp.
(Pl. 14, fig. 1-3)

DESCRIPTION: Amb triangular, apices moderately rounded, sides slightly concave. Trilete 2/3 to 3/4 spore radius. Spore wall 1 to 3 μ thick, foveolate; foveolae circular, 0·5 to 4 μ in diameter, density of foveolae variable from high density with smaller foveolae to low density with larger foveolae. A row of small foveolae may occur along trilete margins. Dimensions, 20 (29) 35 μ, 32 specimens measured.

COMPARISON: Specimens having the larger foveolae resemble *Kuylisporites waterbolkii* Potonié 1956, but lack the large interradial foveolae characteristic of the latter species. Specimens having smaller foveolae differ from *Foveotriletes lacunosus* Partridge n. sp. in shape and in having more closely spaced and sharply delimited foveolae.

HOLOTYPE: Specimen on slide P29723, 30 μ in diameter.

TYPE LOCALITY AND STRATA: Morwell, Victoria; clay split between Morwell 1A and 1B seams, north wall of Morwell Open Cut, *Proteacidites tuberculatus* Zone, early Miocene.

STRATIGRAPHIC RANGE: *Proteacidites tuberculatus* Zone through *Triporopollenites bellus* Zone, early Oligocene through Miocene.

Foveotriletes lacunosus Partridge, n. sp.
(Pl. 14, fig. 6)

DESCRIPTION: Amb triangular, apices moderately to narrowly rounded, sides convex; distal surface convex, proximal surface pyramidal, elevation slight. Trilete rays 3/4 to 4/5 spore radius, marginal lips narrow. Spore wall 1 to 2·5 μ thick, proximal surface psilate, distal surface with poorly delimited, shallow foveolae 0·5 to 1·5 μ in diameter. Dimensions, equatorial diameter 30 (34) 41 μ, 14 specimens measured.

COMPARISON: This species differs from *Foveotriletes crater* by having less well defined foveolae, a convexly rather than a concavely triangular amb, and an unornamented proximal surface.

HOLOTYPE: Specimen on slide P29847, 38 μ in diameter.

TYPE LOCALITY AND STRATA: Lakes Entrance Oil Shaft at 492 ft, Gippsland Limestone, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: *Proteacidites tuberculatus* Zone through *Triporopollenites bellus* Zone, late Oligocene through Miocene.

Foveotriletes palaequetrus Partridge, n. sp.
(Pl. 14, fig. 4, 5)

DESCRIPTION: Amb triangular to vaguely hexagonal, sides straight, recessed between bluntly truncated apices. Trilete rays full spore radius, or nearly so, spore wall commonly split at ends of rays. Spore wall 1·5 to 2 μ thick, foveolate; foveolae poorly delimited, shallow, circular on distal surface and 0·5 to 1·5 μ in diameter, elliptical on proximal surface and up to 3 μ long; distal polar area generally smooth. Dimensions, equatorial diameter 30 (35) 42 μ 8 specimens measured.

COMPARISON: This species differs from *Foveotriletes lacunosus* by having recessed interradial margins and some ornamentation on the proximal surface.

HOLOTYPE: Specimen on slide P29734, 35 μ in diameter.

TYPE LOCALITY AND STRATA: Lakes Entrance Oil Shaft at 1188 ft, Lakes Entrance Formation, *Proteacidites tuberculatus* Zone, early Oligocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone through *Proteacidites tuberculatus* Zone, late Eocene through early Miocene.

Genus **Herkosporites** Stover, n. gen.
Type Species: **Herkosporites elliottii** Stover, n. sp., here designated.

DIAGNOSIS: Spores trilete, amb circular to roundly triangular, proximal surface ornamented only adjacent to trilete rays, distal surface variously ornamented, fimbriate and spinate on known species. Trilete rays greater than 2/3 spore radius, lips raised, membraneous. Affinity unknown.

COMPARISON: *Herkosporites* differs from *Ceratosporites* Cookson & Dettmann 1958 by having ornamentation adjacent to the trilete and from *Styxisporites* Cookson & Dettmann 1958 by lacking an equatorial flange.

Herkosporites elliottii Stover, n. sp.
(Pl. 13, fig. 7)

DESCRIPTION: Spores trilete, amb subcircular to roundly triangular; trilete distinct, rays extend to equatorial margin or nearly so, margins of rays thickened; thickenings give rise to thin, hylate membraneous structure projecting to 5 μ above the proximal surface. Proximal surface psilate in interradial areas, radial areas adjacent to trilete ridges with row of spines on each side of trilete rays. Distal surface spinate; spines to 5 μ in length, about 1 μ in diameter, sides very gently tapered, tips blunt to pointed, evenly distributed, space between adjacent spines 2·5 μ to 4 μ; spore wall about 1 μ thick. Dimensions, 37 (42) 45 μ in diameter, exclusive of spines, 14 specimens measured.

COMPARISON: *Herkosporites elliottii* differs from *Ceratosporites equalis* Cookson & Dettmann 1958 by having ornamentation locally on the proximal surface.

HOLOTYPE: Specimen on slide P29858, 40 μ in diameter, exclusive of spines.

TYPE LOCALITY AND STRATA: Loy Yang-842 bore at 483-486 ft, *Proteacidites tuberculatus* Zone, early Oligocene.

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone through most of the *Triporopollenites bellus* Zone, middle Paleocene into late Miocene.

Genus **Ischyosporites** Balme 1957
Ischyosporites gremius Stover, n. sp.
(Pl. 14, fig. 8)

DESCRIPTION: Amb convexly triangular, proximal surface pyramidal, distal surface strongly convex; trilete distinct, rays extend 1/2 to 3/4 spore radius. Proximal surface smooth, distal surface foveo-reticulate; lumen circular to elliptical, 5-7 μ in diameter, moderately spaced, occasional adjacent lumen coalesced. Spore wall 2 to 3 μ thick interradially, up to 4·5 μ thick radially. Dimensions, 49 (57) 62 μ in diameter, 23 specimens measured.

COMPARISON: *Ischyosporites gremius* differs from *I. punctatus* Cookson & Dettmann 1958 by having a smooth rather than a punctate proximal surface and from *I. crateris* Balme 1957 by having smaller lumina, a shorter trilete and a thinner spore wall.

HOLOTYPE: Specimen on slide P28057, 52 x 58 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-1 well at 5400 ft, *Malvacipollis diversus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the Upper *Nothofagidites asperus* Zone, early Eocene into the early Oligocene.

Genus **Kuylisporites** Potonié 1956
Kuylisporites waterbolkii Potonié 1956
(not illustrated)

1955 *Hemitelia* type, Kuyl, Muller & Waterbolk, Pl. 1, fig. 7.
1956 *Kuylisporites waterbolkii*, Potonié, p. 36, Pl. 4, fig. 36.
1973 ————, Potonié, Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the *Proteacidites tuberculatus* Zone, early Eocene to early Miocene.

Genus **Latrobosporites** Harris 1965
Type Species: **Latrobosporites crassus** Harris 1965, monotypic when proposed.

REMARKS: Examination of trilete spores from the lower portion of the Latrobe Group (*Tricolporites lilliei* through the *Lygistepollenites balmei* Zones) indicates that forms with hamulate ornamentation tend to occur most consistently within this interval. Hamulate spores have been assigned to different form genera on relatively minor dissimilarities in the widths and completeness of an equatorial structure present on some but not all species. We believe the Gippsland Basin specimens belong to *Latrobosporites* Harris 1965 which is characterized by having a hamulate ornamentation that may be developed more coarsely on the distal than the proximal surface and by lacking crassitudes or by having only slight increases in the thickness of the spore wall in the interradial areas. The two species cited below are here transferred to *Latrobosporites* and selected synonymies are given for these forms.

Latrobosporites amplus (Stanley) Stover, n. comb.
(not illustrated)

1965 *Hamulatisporis amplus* Stanley, p. 242, Pl. 29, figs. 1-6.
1968 *Camerozonosporites amplus* (Stanley) Dettmann & Playford, p. 79, Pl. 7, figs. 1-3.

STRATIGRAPHIC RANGE: *Tricolporites lilliei* and *Tricolpites longus* Zones, Late Cretaceous to early Paleocene, possibly middle Paleocene.

Latrobosporites crassus Harris
(not illustrated)

1965 *Latrobosporites crassus* Harris, p. 18, Pl. 25, figs. 8, 9; Pl. 26, fig. 1.

COMMENTS ON HOLOTYPE: The distinctive hamulate ornamentation pattern is coarser and more clearly defined on the distal surface, with the angular rugulae and intervening grooves being smaller and narrower on the proximal surface.

STRATIGRAPHIC RANGE: *Tricolpites longus* Zone into *Malvacipollis diversus* Zone, early Paleocene into early Eocene.

Latrobosporites ohaiensis (Couper) Stover, n. comb.
(not illustrated)

1953 *Trilites ohaiensis* Couper, p. 30, Pl. 3, fig. 23.
1960 ———— Couper, Couper, p. 41, Pl. 2, figs. 7, 8.
1968 *Camerozonosporites ohaiensis* (Couper) Dettmann & Playford, p. 80, Pl. 7, figs. 6, 7.
1973 ———— (Couper) Dettmann & Playford, Stover & Evans (in press)

STRATIGRAPHIC RANGE: *Tricolporites lilliei* Zone into the *Lygistepollenites balmei* Zone, Late Cretaceous to middle Paleocene.

Genus **Matonisporites** Couper emended Dettmann 1963
Matonisporites ornamentalis (Cookson) Partridge, n. comb.
(Pl. 13, figs. 3, 4)

1947 *Trilites ornamentalis* Cookson, p. 136, 137, Pl. 16, figs. 63, 64 and *T. cf. ornamentalis*, Pl. 16, fig. 65.

DESCRIPTION (Revised): Amb triangular, apices moderately rounded, interradial margins straight to slightly concave, convex in flattened specimens. Trilete rays straight, extend to inner margin of spore wall. Spore wall 1 to 2 μ thick proximally and interradially, 3 to 5 μ thick apically, 3 μ thick distally; wall may have thickened bands 3 to 8 μ wide adjacent to trilete, proximal surface smooth, distal surface smooth, or with low irregular ruguloid thickenings. Dimensions, 28 (41) 55 μ in diameter, 28 specimens measured.

STRATIGRAPHIC RANGE: From within the Lower *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, late Eocene through Miocene.

Genus **Ornamentifera** Bolkhovitina 1966
Ornamentifera sentosa Dettmann & Playford 1968
(not illustrated)

1968 *Ornamentifera sentosa* Dettmann & Playford, p. 78, 79, Pl. 6, figs. 9-12.
1973 ———— Dettmann & Playford, Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Tricolporites lilliei* Zone into the *Lygistepollenites balmei* Zone, Late Cretaceous to middle Paleocene.

Genus **Polypodiaceoisporites** Potonié 1951
Polypodiaceoisporites tumulatus, Partridge, n. sp.
(Pl. 16, fig. 4)

DESCRIPTION: Amb triangular, apices broadly rounded, sides slightly concave; in equatorial view distal surface convex to broadly V-shaped, proximal surface flat to obtusely arched. Trilete rays about 1/2 or more of spore radius, do not reach spore margin, bordered by thickened bands 2 to 3 μ wide and vague, discontinuous, low elevations in the contact areas, remainder of proximal surface psilate. Distal surface with verrucae of 2 to 3 μ in diameter in the marginal areas; distal polar area with larger verrucae or with flat, irregular rugulae. Cingulum psilate, 3 to 5 μ wide, of constant width or slightly narrower around apices. Dimensions, 32 (39) 44 μ in diameter, 18 specimens measured.

COMPARISON: The new species differs from *Polypodiaceoisporites obscurus* Harris 1965 by having a wider cingulum and a non-rugulate proximal surface.

HOLOTYPE: Specimen on slide P29780, 43 μ in diameter.

TYPE LOCALITY AND STRATA: Wurruk-1 well at 426 ft, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: *Triporopollenites bellus* Zone only, late Miocene.

Genus **Rugulatisporites** Thomson & Pflug 1953
Rugulatisporites mallatus Stover, n. sp.
(Pl. 15, fig. 1)

1965 *Convolutisporites* sp. indent. Harris, Pl. 25, fig. 13.
1973 *Rugulatisporites* sp. A, Stover & Evans (in press)

DESCRIPTION: Amb convexly triangular. Proximal and distal surfaces densely ornamented with short, discontinuous, sinuous ridges; crests of ridges blunt, gently rounded, cross section of ridges mushroom shaped. Ridges adjacent to trilete linear and parallel to rays. Trilete indistinct, deeply incised, rays straight, extend 3/4 to full spore radius. Ridges about 2 to 4 μ wide at crests, distance between ridges 1 μ or less. Dimensions, 36 (42) 47 μ in diameter, 20 specimens measured.

COMPARISON: No species with similarly shaped ridges is known.

HOLOTYPE: Specimen on slide P28050, 40 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 4648 ft, *Malvacipollis diversus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone through *Triporopollenites bellus* Zone, middle Paleocene through late Miocene.

Rugulatisporites micraulaxus Partridge, n. sp.
(Pl. 15, fig. 2, 3)

DESCRIPTION: Amb roundly triangular to subcircular. Spore wall 1·5 to 3 μ thick, obvermiculate to rugulate on proximal and distal surfaces. Ornamentation varies from ridges 1·5 to 3 μ wide, flat or curved distally intervening areas 0·5 to 1 μ wide, discontinuous to ridges 0·5 to 1 μ wide, pointed or rounded distally, intervening areas 1 to 3 μ wide, interconnected. Trilete rays approximately 4/5 spore radius, margined by unsculptured area 2 to 3 μ wide. Dimensions, 28 (36) 45 μ in diameter, 21 specimens measured.

COMPARISON: Consult comparison for *Rugulatisporites trophus*.

HOLOTYPE: Specimen on slide P29796, 37 μ in diameter.

TYPE LOCALITY AND STRATA: Wurruk-1 well at 426 ft, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: *Triporopollenites bellus* Zone, late Miocene.

Rugulatisporites trophus Partridge, n. sp.
(Pl. 15, fig. 4)

DESCRIPTION: Amb subcircular, outline elliptical in equatorial view. Spore wall 5 to 9 μ thick (usually 7 to 8 μ), rugulae 2 to 10 μ wide, most frequently 2 to 5 μ wide, distribution random, crests flat to broadly rounded. Trilete indistinct, rays 3/4 or more of spore radius, rays may be margined by straight rugulae. Dimensions 43 (53) 62 μ in diameter, 14 specimens measured.

COMPARISON: *Rugulatisporites trophus* differs from *R. micraulaxus* Partridge by having wider rugulae, a thicker spore wall and a greater diameter. The former differs from *R. mallatus* Stover by having flat to gently rounded rugulae that are not mushroom shaped in cross section and a thicker spore wall.

HOLOTYPE: Specimen on slide P29794, 59 μ in diameter.

TYPE LOCALITY AND STRATA: Wurruk-1 well at 2898 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone into the lower part of the *Proteacidites tuberculatus* Zone, middle Eocene into early Oligocene.

Genus **Stereisporites** Pflug 1953
Stereisporites (Tripunctisporis) sp.
(not illustrated)

1973 *Stereisporites* (*Tripunctisporis*) sp. Stover & Evans (in press).

REMARKS: Krutzsch (*in* Doring et al, 1966) proposed the subgenus *Tripunctisporis* for sphagnoid spores which have three triangularly arranged, distal, polar fovae or punctae. At the same time he defined and illustrated 10 new species from the Late Cretaceous (Senonian)—Paleocene of Europe. Attempts to assign Australian specimens to one or more of Krutzsch's species were unsuccessful owing mainly to the overlapping characteristics of many forms and the instability of morphologic features of supposed taxonomic value. Because too few specimens of this relatively uncomplex form were assembled to adequately evaluate species in terms of variability, the Australian specimens are recorded under the heading shown above.

STRATIGRAPHIC RANGE: *Tricolpites longus* Zone through the Upper *Nothofagidites asperus* Zone, Paleocene to early Oligocene.

Stereisporites regium (Drozhastichich) Drugg 1967
(not illustrated)

1967 *Sphagnum regium* Drozhastichich *in* Samoilovich et al p. 18. Pl. 2, figs. 1-3.
1965 ———— Dorzhastichich, Stanley, p. 238, Pl. 27, figs. 12-17.
1967 *Stereisporites regium* (Drozhastichich) Drugg, p. 37, Pl. 6, fig. 20.
1973 ———— (Drozhastichich) Drugg, Stover & Evans (in Press).
STRATIGRAPHIC RANGE: Upper part of *Tricolporites lilliei* Zone into the *Lygistepollenites balmei* Zone, Late Cretaceous to middle Paleocene, possibly into the late Paleocene.

Genus **Verrucosisporites** Potonié & Kremp 1955
Verrucosisporites kopukuensis (Couper) Stover, n. comb.
(Pl. 16, figs. 2, 3)

1960 *Trilites kopukuensis* Couper, p. 42, Pl. 3, figs. 1, 2.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through *Triporopollenites bellus* Zone, early Eocene through Miocene.

REMARKS: The absence of apical thickenings precludes retention of this species in *Trilites* as emended by Dettmann (1963), and because it possesses discrete verrucae, assignment to *Verrucosisporites* is appropriate. Although the ornamentation is mainly verrucate, the size, shape and density of the verrucae are variable and on some specimens granulae or gemmae are also present. The verrucae vary from circular to polygonal, are usually so closely spaced that similar size verrucae could not be placed between those already present. On some specimens the space between the verrucae is so close that a negative reticulum is formed, whereas on other specimens, the verrucae are rather widely spaced with the intervening areas filled by granulae.

The equatorial outline varies from nearly circular to concavely triangular, and in size the specimens are from 65 to 170 μ in diameter. Specimens from the older end of the range tend to be smaller and less variable than those from the younger end of the range and broken specimens are common components in some assemblages.

Verrucosisporites cristatus Partridge, n. sp.
(Pl. 15, fig. 5)

DESCRIPTION: Amb convexly triangular, commonly modified by folding, specimens usually flattened along polar axis. Trilete 2/3 to nearly full spore radius, without lips. Spore wall 1·5 to 4 μ thick, exclusive of ornamentation, latter composed of discrete, closely spaced capilli or filiform processes. Bases of processes generally constricted, distal ends flared with an irregular outline, processes 7 to 8 μ wide, up to 7 μ high, tips rounded or digitate. Spore wall between processes smooth or irregularly roughened. Dimensions, equatorial diameter 60 (82) 95 μ, 11 specimens measured.

COMPARISON: This species differs from *Verrucosisporites kopukuensis* (Couper) Stover (this paper) by having more irregularly shaped projections.

HOLOTYPE: Specimen on slide P29804, 70 μ in diameter.

TYPE LOCALITY AND STRATA: Lakes Entrance Oil Shaft at 1188 ft, Lakes Entrance Formation, *Proteacidites tuberculatus* Zone, early Oligocene.

STRATIGRAPHIC RANGE: Within the Lower *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, late Eocene through Miocene.

Monolete spores

Genus **Peromonolites** Couper 1953
Peromonolites densus Harris 1965
(not illustrated)

1965 *Peromonolites densus* Harris, p. 84, Pl. 24, figs. 3-5.
1973 ———— Harris, Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone through the *Triporopollenites bellus* Zone, middle Paleocene through Miocene.

Peromonolites vellosus Partridge, n. sp.
(Pl. 15, fig. 6; Pl. 16, fig. 1)

DESCRIPTION: Amb elliptical to straight sided with rounded ends, outline plano-convex or concavo-convex in lateral view. Spore wall two layered, inner layer 1·5 to 2 μ thick, psilate; outer layer 3 to 4 μ thick composed of a basal portion less than 1 μ to slightly more than 1 μ thick and an outer, fibrous, mat-like mass imparting a furry appearance to the spores; two wall layers may be conspicuously separated from each other or they may be closely appressed. Monolete in psilate inner layer of flat of concave surface, length greater than 3/4 spore length. Dimensions, length 32 (41) 52 μ, width 22 to 40 μ, 27 specimens measured.

COMPARISON: *Peromonolites vellosus* differs from *P. densus* Harris 1965 by having a mat-like rather than an irregularly folded or wrinkled outer layer. The latter is also thicker than that on *P. densus*.

HOLOTYPE: Specimen on slide P29795, 45 x 33 μ overall, inner wall layer 36 x 25 μ.

TYPE LOCALITY AND STRATA: Glencoe-4 well at 280 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone through the *Triporopollenites bellus* Zone, middle Paleocene to late Miocene.

Bisaccate Pollen

Genus **Lygistepollenites** Stover & Evans 1973
Lygistepollenites balmei (Cookson) Stover & Evans 1973
(not illustrated)

1957 *Dacrydiumites balmei* Cookson, p. 46, Pl. 9, figs. 11-14.
1965 ——— Cookson, Harris, p. 87, Pl. 26, fig. 17.
1973 *Lygistepollenites balmei* (Cookson) Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Tricolporites lilliei* Zone through the *Lygistepollenites balmei* Zone, Late Cretaceous through Paleocene.

Lygistepollenites ellipiticus (Harris) Stover & Evans 1973
(not illustrated)

1965 *Dacrydiumites ellipticus* Harris, p. 87, Pl. 26, figs. 20, 21.
1973 *Lygistepollenites ellipticus* (Harris) Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone, middle and late Paleocene.

Lygistepollenites florinii (Cookson & Pike) Stover & Evans 1973
(not illustrated)

1953 *Dacrydiumites florinii* Cookson & Pike, p. 479, Pl. 3, figs. 20-35.
1965 ——— Cookson & Pike, Harris, p. 87, Pl. 26, fig. 18.
1973 *Lygistepollenites florinii* (Cookson & Pike) Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone through the *Triporopollenites bellus* Zone, middle Paleocene through Miocene.

Genus **Parvisaccites** Couper 1958
Parvisaccites catastus Partridge, n. sp.
(Pl. 16, fig. 5, 6)

DESCRIPTION: Body elliptical, longer than wide, exine finely infrareticulate, 1·5 to 2 μ proximally, thinner distally; tenuitas thin and usually split, width 8 to 10 μ. Sacci pendant, broadly elliptical in polar view, more or less semicircular in lateral view, proximal roots equatorial or nearly so, distal roots margin tenuitas; sacci infrareticulate, pattern somewhat radial from distal roots, denser and more distinctly reticulate equatorially and proximally, mesh coarsest at extremities. Outer surface of sacci smooth. Dimensions, overall length 35 (47) 40 μ, 15 specimens measured.

COMPARISON: *Parvisaccites catastus* differs from the type species, *P. radiatus* Couper 1958, by having a more distinct reticulation in the sacci and the proximal surface of the body. The new species differs from *Lygistepollenites florinii* (Cookson & Pike) Stover & Evans 1973 by having smoothly rounded sacci outlines and by lacking looped endosexinal ridges within the sacci.

HOLOTYPE: Specimen on slide P29746, 62 x 45 μ overall.

TYPE LOCALITY AND STRATA: Willung-121 bore at 246-248 ft, Lower *Nothofagidites asperus Zone*, late Eocene.

STRATIGRAPHIC RANGE: Upper part of *Lygistepollenites balmei* Zone into the basal part of the *Proteacidites tuberculatus* Zone, late Paleocene into early Oligocene.

Genus **Phyllocladidites** Cookson ex Couper emended Stover & Evans 1973
Phyllocladidites mawsonii Cookson ex Couper 1953
(not illustrated)

STRATIGRAPHIC RANGE: *Nothofagidites senectus* through the *Triporopollenites bellus* Zones, Late Cretaceous (Senonian) through Miocene.

Phyllocladidites reticulosaccatus Harris 1965
(not illustrated)

1965 *Phyllocladidites reticulosaccatus* Harris, p. 86, Pl. 26, fig. 16.

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone, middle and late Paleocene.

Phyllocladidites verrucosus Stover & Evans 1973
(not illustrated)

1957 *Dacrydiumites mawsonii* Cookson *f. verrucosus* Cookson, p. 47, 49, Pl. 9, figs. 15, 16.
1973 *Phyllocladidites verrucosus* Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Tricolporites lilliei* through *Lygistepollenites balmei* Zones, Late Cretaceous through Paleocene.

Monocolpate Pollen

Genus **Dryptopollenites** Stover, n. gen.
Type Species: **Dryptopollenites semilunatus** Stover, n. sp. here designated.

DIAGNOSIS: Amb broadly elliptical, outline in lateral view more or less semicircular, aperture along flat or slightly convex surface. Sulcus extends full length of pollen; exine thin, stratified, sculpturing scabrate on type species. Specimens occur singularly, in pairs, or rarely as tetrads. Monotypic, affinity uncertain, pollen somewhat similar to those of the Dioscoreaceae, Magnoliaceae and Palmae.

COMPARISON: *Dryptopollenites* differs from *Cycadopites* in shape by having a broadly rounded outline in polar view in contrast to the more narrow, nearly fusiform outline of *Cycadopites*. The sulcal margins are usually irregular and gaping and the grains are more coarsely sculptured adjacent to the apertural margins than over the rest of the exine. Among specimens of *Cycadopites*, the sulcal margins are close together or overlapping and the exine appears sculptureless.

Dryptopollenites semilunatus Stover, n. sp.
(Pl. 17, fig. 1, 2)

DESCRIPTION: Pollen monosulcate, broadly elliptical in polar view, outline semicircular or nearly so in lateral view. Aperture sulcate, wide, ends usually broadly rounded, margins irregular and extend to full length or almost the full length of the grains. Exine thin, about 1 μ or less, sculpturing indistinct to scabrate, coarsest adjacent to the apertural margins. Dimensions, 26 (30) 33 μ in length, 20 of more than 100 specimens measured.

HOLOTYPE: Specimen on slide P28049, 30 μ in length.

TYPE LOCALITY AND STRATA: Bass-2 well at 4308 ft, *Proteacidites asperopolus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone into the lower part of the Lower *Nothofagidites asperus* Zone, early and middle Eocene.

REMARKS: Specimens vary considerably in shape according to their orientation, amount of folding and the width of the sulcus. In none of the specimens seen in polar view were the ends of the pollen narrowly rounded, and in only a few individuals were the margins of the sulcus touching or overlapping. There is also a tendency for two (rarely more than two) grains to remain attached at their antapical ends. The species is recognizable, in spite of its variable shape, by the irregular band of coarser sculpturing bordering the sulcus which does not appear to be due to a particular mode of preservation nor to partial destruction of exine by oxidation or processing.

Genus **Liliacidites** Couper 1953
Liliacidites bainii Stover, n. sp.
(Pl. 16, fig. 7, 8)

1973 *Liliacidites* sp. A, Stover & Evans (in press).

DESCRIPTION: Amb elliptical, commonly modified by folding, lateral view somewhat reniform. Sulcus extends nearly the full length of the pollen, sulcal margins smooth, outline of sulcus generally of irregular width. Nexine very thin, sexine about 1·5 μ thick, tips of pilate columellae fused to form small mesh reticulum; muri and lumina largest on the proximal surface at or near mid length, become progressively smaller towards the distal surface and towards the narrow ends of the pollen. Dimensions, 39 (47) 53 μ in length; width, 27 to 36 μ, 11 specimens measured.

COMPARISON: *Liliacidites bainii* differs from *L. lanceolatus* Stover (this paper) by having a finer mesh reticulation, particularly in the medial area of the pollen, and by being larger.

HOLOTYPE: Specimen on slide P28095, 46 x 28 μ.

TYPE LOCALITY AND STRATA: Bass-2 well at 3996 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: *Proteacidites asperopolus* Zone to about midway through the Lower *Nothofagidites asperus* Zone, early Eocene into the late Eocene.

Liliacidites lanceolatus Stover n. sp.
(Pl. 16, fig. 9, 10)

DESCRIPTION: Amb elliptical, ends generally narrowly rounded. Sulcus extends full length of pollen, or nearly so, margins smooth. Exine stratification distinct, sexine thicker than nexine, latter very thin, sexine about 1 μ at midlength, slightly less at ends of pollen, reticulate. Lumina and muri larger at midlength and decrease gradually in size with the lumina becoming more regular in shape towards the ends of the pollen. Columellae singular, more widely spaced and distinct at midlength; dense, smaller and rather indistinct at the ends of the pollen. At and near midlength on some specimens the muri are perforate. Dimensions, 37 (40) 44 μ in length, 22 (24) 27 μ in width, 8 specimens measured.

COMPARISON: Consult comparison for *Liliacidites bainii* Stover.

HOLOTYPE: Specimen on slide P28050, 37 x 24 μ.

TYPE LOCALITY AND STRATA: Bass-2 well at 4648 ft, *Malvacipollis diversus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* through *Triporopollenites bellus* Zones, early Eocene through Miocene.

Genus **Spinizonocolpites** Muller 1968
Spinizonocolpites prominatus (McIntyre) Stover & Evans 1973
(not illustrated)

1965 *Monosulcites prominatus* McIntyre, p. 214, figs. 33, 34.
1965 *Baltisphaeridium taylori* Cookson & Eisenack, p. 137, Pl. 16, figs. 9-11.
1968 *Spinizonocolpites echinatus* Muller, p. 11, 12, Pl. 3, fig. 3.
1973 *Spinizonocolpites prominatus* (McIntyre) Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone into the Lower *Nothofagidites asperus* Zone, early and middle Eocene.

Tricolpate Pollen

Genus **Beaupreaidites** Cookson 1950
Beaupreaidites elegansiformis Cookson 1950
(not illustrated)

1950 *Beaupreaidites elegansiformis* Cookson, p. 168, Pl. 1, figs. 2-4.
1973 ——— Cookson, Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the *Triporopollenites bellus* Zone, early Eocene through Miocene.

REMARKS: The lectotype, designated by Potonié (1960), is located on slide P29693, 52 μ in diameter and illustrated by Cookson (1950, Pl. 1, fig. 4).

Beaupreaidites verrucosus Cookson 1950
(not illustrated)

1950 *Beaupreaidites verrucosus* Cookson, p. 169, Pl. 1, figs. 6, 7.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone into the *Proteacidites tuberculatus* Zone, early Eocene into early Oligocene.

LECTOTYPE: Specimen on slide P29669, 45 μ in diameter, and illustrated by Cookson (1950, Pl. 1, fig. 3).

TYPE LOCALITY AND STRATA: Wensleydale, Victoria, about 10 miles NW. of Anglesea, lignitic clay, Eocene, probably early Eocene, zone equivalent uncertain.

Genus **Gothanipollis** Krutzsch 1959

Gothanipollis bassensis Stover, n. sp.
(Pl. 17, figs. 13-16)

DESCRIPTION: Pollen syncolpate or syncolporate (?), amb concavely triangular, apices bluntly rounded. Exine thin, less than 1 μ, stratification indistinct; nexine extremely thin, indistinguishable in optical section; sexine psilate in apical areas and adjacent to colpi, finely granular in interapical areas. Colpi usually gaping, margins faint, straight to somewhat sinuous, suggestion of ora on some specimens at apices. Dimensions, 16 (18) 21 μ in diameter, 7 specimens measured.

COMPARISON: Of the species assigned to *Gothanipollis*, *G. bassensis* resembles most closely *G. cockfieldensis* Englehardt 1964 from the Eocene of Mississippi, U.S.A. The new species differs from the latter by having more rounded, less recurved apices, seemingly wider colpi and finer granulation in the interapical areas.

HOLOTYPE: Specimen on slide P28066, 17 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 3996 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone into the lower part of the *Proteacidites tuberculatus* Zone, middle Eocene through Oligocene.

Genus **Myrtaceidites** Cookson & Pike ex Potonié 1960

COMMENTS: Pollen conformable to the form genus *Myrtaceidites* are common in the majority of Eocene and younger assemblages from the Gippsland Basin. Although easily identifiable on a generic level, at the species level it is extremely difficult to determine species consistently and reliably. The main difficulty is the comparatively simple morphology of the pollen coupled with considerable variability of the few morphologic features. These are the shape of the pollen in polar view, the presence or absence of polar islands and their size, the nature of the pores or vestibuli and the thickness of the exine and its sculpturing which is usually indistinct. Most of the species described by Cookson & Pike (1954) cannot be maintained when a large number of specimens are available for study. Stratigraphically, forms of *Myrtaceidites* occur initially in the *Lygistepollenites balmei* Zone, increase in abundance and diversity in Eocene zones and continue to range through the Miocene. Two species of stratigraphic significance are dealt with below.

Myrtaceidites tenuis Harris 1965
(not illustrated)

1965 *Myrtaceidites tenuis* Harris, p. 90, Pl. 27, figs. 30, 31.
1973 ——— Harris, Stover & Evans (in press).

STRATIGRAPHIC RANGE: Within the *Malvacipollis diversus* Zone through the *Proteacidites asperopolus* Zone, early Eocene.

Myrtaceidites verrucosus Partridge, n. sp.
(Pl. 17, fig. 17-19)

DESCRIPTION: Pollen subisopolar, amb triangular, sides slightly convex. Apertures colporate, ends of colpi extend to about midway between the poles and equator or beyond to outline polar islands, polar areas or islands 4 to 10 μ in diameter, vestibuli variably developed, always present. Exine 0·5 to 2 μ thick, nexine thinner than sexine, latter granulate or verrucate, size of sculpturing proportional to the size of the pollen, on large specimens verrucae are larger equatorially (up to 3 μ long) and on small specimens the sculpturing is more distinct at the poles. Dimensions, equatorial diameter 12 (18) 26 μ, 18 specimens measured.

COMPARISON: *Myrtaceidites verrucosus* differs from other species of *Myrtaceidites* by having a distinctively sculptured exine.

HOLOTYPE: Specimen on slide P29743, 25 μ in diameter.

TYPE LOCALITY AND STRATA: Yallourn Open Cut, Victoria, clay at floor of the cut, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: *Proteacidites asperopolus* Zone through *Triporopollenites bellus* Zone, early Eocene through Miocene.

Genus **Tricolpites** Cookson ex Couper 1953
Type Species: **Tricolpites reticulatus** Cookson 1947, designated by Couper (1953, p. 61)

REMARK: The form genus *Tricolpites* is used following Couper (1953) for tricolpate grains with variable exine sculpture.

Tricolpites confessus Stover, n. sp.
(Pl. 17, fig. 3)

1973 *Tricolpites* sp. A, Stover & Evans (in press).

DESCRIPTION: Pollen isopolar, amb circular. Triaperturate, colpi 8 to 12 μ long, rather deeply incised, commonly open, with the suggestion of an inner membrane (nexine?) across the colpi on some specimens, apocolpia about 3 to 4 μ in diameter. Exine approximately 1·5 μ thick, not clearly differentiated, surface psilate with slight irregularities when viewed in phase contrast. Dimensions, equatorial diameter 19 (21) 25 μ, 16 specimens measured.

Comparison: In size and shape, *Tricolpites confessus* is similar to *T. pannosus* Dettmann & Playford 1968 but differs by having more deeply incised colpi, a slightly thicker exine and a psilate surface.

Holotype: Specimen on slide P28097, 22 μ in diameter.

Type Locality and Strata: Tuna-1 well at 5927 ft, *Tricolpites longus* Zone, early Paleocene, possibly middle Paleocene.

Stratigraphic Range: *Tricolporites lilliei* and *Tripites longus* Zones, Late Cretaceous to early Paleocene, possibly middle Paleocene.

Tricolpites gillii Cookson 1957
(not illustrated)

1957 *Tricolpites gillii* Cookson, p. 49, Pl. 10, figs. 12-15.
1965 ———— Cookson, Harris, p. 88, Pl. 27, fig. 13.
1968 ———— Cookson, Dettmann & Playford, p. 84, Pl. 8, fig. 14.
1969 ———— Cookson, Dettman & Playford, p. 13, fig. 19.
1973 ———— Cookson, Stover & Evans (in press).

Stratigraphic Range: *Nothofagidites senectus* Zone into the lower part of the *Malvacipollis diversus* Zone, Late Cretaceous (Senonian) into early Eocene.

Tricolpites incisus Stover, n. sp.
(Pl. 17, fig. 4, 5)

Description: Pollen isopolar, amb circular, oblate in equatorial view. Exine stratification fairly distinct, nexine about 0·5 μ or less in thickness, sexine about 1 μ thick, reticulate. Lumina of reticulum irregularly polygonal, 1 to 2 μ in diameter, generally smaller in polar than in equatorial areas; muri less than 1 μ in width, commonly perforate, perforations about 0·5 μ in diameter and usually more numerous in the equatorial areas. Colpi long, straight, margins smooth, apocolpia small. Dimensions, equatorial diameter variable depending upon amount of compression, varies between 21 and 33 μ, average polar diameter about 25 μ, 13 specimens measured.

Comparison: *Tricolpites incisus* differs from other tricolpate reticulate pollen by having perforate muri over a major portion of the pollen.

Holotype: Specimen on slide P28049, 31 μ in diameter.

Type Locality and Strata: Bass-2 well at 4308 ft *Proteacidites asperopolus* Zone, early Eocene.

Stratigraphic Range: Upper part of *Malvacipollis diversus* Zone into Lower *Nothofagidites asperus* Zone, early Eocene to late Eocene.

Tricolpites longus Stover & Evans 1973
(not illustrated)

1973 *Tricolpites longus* Stover & Evans (in press).

Stratigraphic Range: Upper part of *Tricolporites lilliei* Zone through *Tricolpites longus* Zone, Late Cretaceous through early Paleocene, possibly middle Paleocene.

Tricolpites phillipsii Stover, n. sp.
(Pl. 17, fig. 6, 7)

1973 *Tricolpites* sp. B, Stover & Evans (in press).

Description: Pollen isopolar, amb convexly triangular, oblate in polar view. Exine about 1 μ thick, slightly thicker along apertures on some specimens, indistinctly differentiated, nexine appears thinner than sexine but not appreciably so. Exine shallowly incised by narrow, meandroid grooves surrounding irregularly shaped islands of sexine. Colpi short, commonly with uneven margins, and on some specimens the margins are smooth and thickened. Dimensions, equatorial diameter 25 (30) 36 μ, 12 specimens measured.

Comparison: *Tricolpites phillipsii* differs from *T. gillii* Cookson 1957 by having a distinctly sculptured exine, and convex rather than slightly concave sides.

Holotype: Specimen on slide P28066, 30 μ in diameter.

Type Locality and Strata: Bass-2 well at 3996 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

Stratigraphic Range: *Lygistepollenites balmei* Zone through the Lower *Nothofagidites asperus* Zone, middle Paleocene into late Eocene.

Tricolpites sabulosus Dettmann & Playford 1968
(not illustrated)

1968 *Tricolpites sabulosus* Dettmann & Playford, p. 85, Pl. 8, figs. 11-31.

Stratigraphic Range: *Nothofagidites senectus* Zone into the *Tricolporites lilliei* Zone, Late Cretaceous.

Tricolpites simatus Partridge, n. sp.
(Pl. 17, figs. 8-11)

Description: Pollen isopolar, amb triangular with straight to concave sides and truncated or broadly rounded apices. Colpi 3 to 10 μ long (average length 6 μ), commonly with faint arci-like poleward extensions. Exine vaguely to moderately well differentiated, columellae not discernible, exine from less than 1 μ to 2 μ thick, finely perforate interapically, nexine equal to or greater than sexine in thickness. Polar areas with triangular to subcircular psilate thickenings whose outlines parallel that of the equatorial margin, sides of polar thickenings generally faintly striate. Dimensions, 17 (22) 26 μ in diameter, 38 specimens measured.

Comparison: The triangular to subcircular polar thickenings are diagnostic of the species which differs from *Tricolpites thomasii* Cookson & Pike 1954 by lacking interradial reticulation.

Holotype: Specimen on slide P29755, 24 μ in diameter.

TYPE LOCALITY: Willung-121 bore at 324-326 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone, middle into late Eocene.

Tricolpites thomasii Cookson & Pike 1954
(Pl. 17, fig. 12)

1954 *Tricolpites thomasii* Cookson & Pike, p. 214, Pl. 2, figs. 92-94.

LECTOTYPE: Specimen on slide P29660, and illustrated by Cookson & Pike (1954, Pl. 2, fig. 92).

TYPE LOCALITY AND STRATA: Birregurra-1 well at 842-843 ft, Eocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone, middle Eocene into the lower part of the late Eocene.

Tricolporate Pollen

Genus **Anisotricolporites** Partridge, n. gen.
Type species: **Anisotricolporites triplaxis** Partridge, n. sp. here designated.

DIAGNOSIS: Pollen free, anisopolar, triaperturate, apertures equatorial, pores in nexine circular and simple; colpi in sexine developed on one polar surface only. Surface of sexine granulate on type species. Monotypic, affinity unknown.

COMPARISON: The development of colpi on just one polar surface distinguishes this form from other tricolporate form genera.

Anisotricolporites triplaxis Partridge, n. sp.
(Pl. 18, fig. 8, 9)

DESCRIPTION: Amb convexly triangular; anisopolar, polar surface with colpi (distal surface?) more convex than opposite surface. Apertures equatorial, tricolporate; pores circular, 2 to 3 μ in diameter; colpi on one hemisphere only, colpi as wide as pores at the equator, narrow gradually toward the pole, apocolpia small. Exine 1 to 1·5 μ, sexine and nexine clearly differentiated only adjacent to the apertures, approximately equally thick, columellae not discernible; surface of exine densely granulate. Dimensions, equatorial diameter 17 (19) 22 μ, 17 specimens measured; polar diameter 18 to 19 μ, 4 specimens.

HOLOTYPE: Specimen on slide P29728, 18 μ in diameter.

TYPE LOCALITY AND STRATA: Willung-121 bore at 324-326 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone, middle Eocene and into lower part of late Eocene.

Genus **Bombacacidites** Couper 1960
Bombacacidites bombaxoides Couper 1960
(Pl. 19, fig. 3)

1960 *Bombacacidites bombaxoides* Couper, p. 53, Pl. 7, figs. 13, 14.

REMARKS: The holotype and paratype of this species were examined by P. R. Evans who concurred with the assignment of the Gippsland Basin specimens to *Bombacacidites bombaxoides*. The nexine is very thin (less than 0·5 μ) except at the apertures, where it is about 1 μ thick and where it forms a margo 1 to 2 μ wide around each colpus. The reticulate sexine and the gradual decrease in the size of the lumina from the polar to the equatorial areas, particularly in the apical regions, are evident on the three Australian specimens.

STRATIGRAPHIC RANGE: *Proteacidites asperopolus* Zone, early Eocene.

Genus **Concolpites** Partridge, n. gen.
Type species: **Concolpites leptos** Partridge, n. sp. here designated.

DIAGNOSIS: Parasyncolpate, isopolar pollen, tricolpate pollen with large atria underlying much of the colpi, amb concavely triangular. Exine stratified, sexine thicker than nexine, latter absent in apertural equatorial areas. Monotypic, affinity unknown.

COMPARISON: *Concolpites* differs from *Cupanieidites* Cookson & Pike 1954 by having large, conspicuous atria and a convexly triangular amb. In addition, the type species of *Concolpites* is significantly smaller than species of *Cupanieidites*.

Concolpites leptos Partridge, n. sp.
(Pl. 18, figs. 1, 2)

DESCRIPTION: Amb convexly triangular, pollen parasyncolpate, polar islands 4 to 6 μ in width. Colpi distinct, atria large, 5 to 6 μ deep, outline in polar view broadly concave or chevron-like, limit of nexine at base of atria whose deepest points also coincide with the positions where the colpi bifurcate to form the polar islands. Exine less than 1 μ thick, nexine extremely thin, sexine very finely reticulate to punctoreticulate in interradial areas. Dimensions, 12 (16) 19 μ in diameter, 14 specimens measured.

HOLOTYPE: Specimen on slide P29756, 19 μ in diameter.

TYPE LOCALITY AND STRATA: Alberton West-138 bore at 188 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: *Proteacidites asperopolus* Zone into basal part of *Proteacidites tuberculatus* Zone, early Eocene to early Oligocene.

Genus **Cupanieidites** Cookson & Pike 1954

1954 *Cupanieidites* Cookson & Pike, p. 210.
1959 *Duplopollis* Krutzsch, p. 144.
1959 *Cupanieidites* Cookson & Pike, emended Krutzsch, p. 144.
1960 ———— Cookson & Pike, Potonié, p. 106.
1965 *Duplopollis* Krutzsch, Harris, p. 89.
1965 *Cupanieidites* Cookson & Pike, Belskey, Boltenhagen & Potonié, p. 77.
1967 ———— Cookson & Pike, Boltenhagen, p. 348.

Type Species: **Cupanieidites major** Cookson & Pike 1954, designated by Krutzsch (1959, p. 144).

COMMENTS: In 1959 Krutzsch proposed *Duplopollis* for the reception of his new species, *D. myrtoides*, and for *D. orthoteichus*—a form previously assigned to *Cupanieidites* by Cookson and Pike (1954). Krutzsch made no definitive distinction between *Duplopollis* and *Cupanieidites*, and stated only that in the former the polar islands are always clearly separated, whereas in the latter they are absent or their presence can be only intimated. Belsky, Boltenhagen and Potonié (1965) found Krutzsch's hazy criterion for separating the two genera untenable and were compelled, therefore, to reject *Duplopollis* and to maintain *Cupanieidites* essentially in its original concept. Specimens from the Gippsland Basin substantiate their observations; the desirability of retaining *Cupanieidites* is further supported by the data presented by Cookson and Pike (1954, p. 211, table 2) in which they show the development of the polar islands is variable among pollen from extant species as well as from fossil material.

Cupanieidites major/orthoteichus
(not illustrated)

Stratigraphic Range: *Malvacipollis diversus* through the *Triporopollenites* bellus Zones, early Eocene through Miocene.

Remarks: Because specimens of *Cupanieidites* spp. occur fairly commonly and consistently in Eocene and younger spore-pollen assemblages from the Gippsland Basin, a fairly large collection of individuals has been recorded. Based on these specimens, separation of *C. major* and *C. orthoteichus* cannot be maintained owing to variability in the size and shape of the pollen in polar view, in the thickness of the exine and the clarity of the exine stratification, in the size and outline of the polar islands as well as their presence or absence, in the size of the sexine reticulation and finally in the prominence and dimensions of the ora. The majority of the specimens conform more closely to the description of *C. orthoteichus* than to that of *C. major*, but no combination of morphologic characters was found that could be used for identifying the two species consistently and confidently.

Until the specimens of *C. major* illustrated by Cookson and Pike (1954) are located and compared with those of *C. orthoteichus*, we prefer to treat the two forms as one species.

Genus **Gemmatricolporites** Leidelmeyer 1966
Gemmatricolporites gestus Partridge, n. sp.
(Pl. 19, fig. 4)

Description: Amb subcircular, outline commonly distorted; oblate to subspherical; tricolporate, pores indistinct, circular, colpi relatively short. Exine exclusive of sculpturing 1·5 to 3 μ thick, nexine equal to or slightly thicker than sexine, columellate layer not discernible. Surface of sexine granulate, gemmate and/or verrucate; granulae 0·5 μ diameter, gemmae and verrucae up to 11 μ in diameter, average size range 3 to 6 μ, height up to 5 μ. Dimensions, 38 (45) 55 μ in diameter, 11 specimens measured.

Comparisons *Gemmatricolporites gestus* differs from *G. divaricatus* Leidelmeyer 1966 and *G. berbicensis* Leidelmeyer 1966 by having more widely spaced, more irregular sculpturing and by being larger.

Holotype: Specimen on slide P29855, 55 μ in diameter.

Type Locality and Strata: Rosedale-1 well at 2287-2289 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

Stratigraphic Range: Lower *Nothofagidites asperus* Zone, middle and late Eocene.

Genus **Intratriporopollenites** (Thomson & Pflug) emended May 1961

Intratriporopollenites notabilis (Harris) Stover, n. comb.
(not illustrated)

1965 *Tiliaepollenites notabilis* Harris, p. 91, Pl. 28, figs. 2, 3.
1973 *Tiliaepollenites notabilis* Harris, Stover & Evans (in press).

Remarks: According to Mai (1961) *Tiliaepollenites* is invalid as a form generic name because the type species is based on pollen from an extant species of *Tilia*, consequently specimens previously attributed to *Tiliaepollenites notabilis* by Harris (1965) and by Stover & Evans (in press) are now identified as *Intratriporopollenites notabilis* (Harris) Stover, n. comb. Supplemental morphological data based on observations made on several exceptionally well preserved species are given below.

The exine consists of a thin nexine (less than 0·5 μ) that thickens appreciably around the apertures and a distinctively sculptured sexine about 1·5 μ thick. A fairly homogeneous columellate layer composed of evenly distributed, low, uniform columellae overlies the nexine and is in turn overlain by a reticulate ectosexine. Almost without exception the muri of the reticulum are narrower than the lumina and are essentially uniform in width. The lumina, in contrast, average slightly over 1 μ across in the polar areas and increase gradually to about 2·5 μ in the interapertural areas. Occasional, widely scattered punctae occur at the intersections of muri on some specimens.

Stratigraphic Range: *Malvacipollis diversus* and *Proteacidites asperopolus* Zones, early Eocene.

Genus **Ilexpollenites** Thiergart ex Potonié 1960
Ilexpollenites anguloclavatus McIntyre 1968
(not illustrated)

1968 *Ilexpollenites anguloclavatus* McIntyre, p. 183, figs. 12, 13.

Remarks: Specimens of *Ilexpollenites anguloclavatus* occur throughout a major portion of the Gippsland Basin Tertiary section. The size, shape and density of the sculpturing as well as the clarity of the apertures are highly variable. Because of variability and the occurrence of intergradational types, it was not possible to separate species consistently or to refer the Gippsland Basin specimens confidently to previously published species. We have, therefore, chosen to place the Australian specimens in *I. anguloclavatus* and to allow greater variability than is indicated in the original description.

STRATIGRAPHIC RANGE: Within the *Tricolpites longus* Zone to about midway through the *Proteacidites tuberculatus* Zone, middle Paleocene into the early Miocene.

Genus **Santalumidites** Cookson & Pike emended Partridge

1954 *Santalumidites* Cookson & Pike, p. 209.
1960 ——— Cookson & Pike, emended Potonié, p. 123.

Type Species: **Santalumidites cainozoicus** Cookson & Pike 1954, monotypic when proposed.

DIAGNOSIS (Emended): Pollen isopolar, prolate, triporate or tricolporate, pores distinct, colpi short. Sexine present in wide equatorial band, absent in polar areas and thickened equatorially, columellae faint, dense, sexine scabrate or psilate.

COMPARISON: *Santalumidites* differs from *Florschuetzia* Germeraad et al 1968 by having porate and colporate apertures and by lacking sexine in the polar area.

Santalumidites cainozoicus Cookson & Pike 1954
(not illustrated)

1954 *Santalumidites cainozoicus* Cookson & Pike, p. 209, Pl. 2, figs. 67-70, not fig. 71.
1960 ——— Cookson & Pike, Potonié, p. 123, Pl. 7, fig. 161.

LECTOTYPE: Potonié (1960) designated the specimen illustrated by Cookson and Pike (1954, Pl. 2, fig. 67) as lectotype, which is located on slide P29677.

STRATIGRAPHIC RANGE: Within *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early Eocene into late Eocene.

REMARKS: Dimensions of 25 Gippsland Basin specimens of *Santalumidites cainozoicus* are: Polar diameter 24 (36) 60 μ, equatorial diameter 15 (22) 43 μ.

Genus **Schizocolpus** Stover, n. gen.
Type Species: **Schizocolpus marlinensis**, Stover, n. sp. here designated.

DIAGNOSIS: Pollen isopolar, oblate, amb roundly triangular, operculate. Apertures tricolporate, each colpus diorate, ora at or near the ends of the colpi. Opercula composed of sexinous material, sexine puncto-reticulate to reticulate on known species, monotypic.

COMPARISON: *Schizocolpus* differs from *Psilatricolporites* (van der Hammen) ex van der Hammen & Wymstra (1964) by having diorate apertures and a distinctly sculptured sexine.

AFFINITY: Possibly Didymelaceae; see drawing of *Didymeles madagascariensis* in Erdtman (1952).

Schizocolpus marlinensis Stover n. sp.
(Pl. 18, figs. 3, 4)

1973 *Tricolporites* sp. A, Stover & Evans (in press).

DESCRIPTION: Pollen isopolar, oblate, amb roundly triangular. Nexine extremely thin (less than 0·5 μ), smooth, exine about 1 μ thick, puncto-reticulate to finely reticulate, lumina or punctae circular or nearly so, less than 1 μ in diameter, muri also less than 1 μ in diameter. On some specimens the diameter of the lumina tends to be slightly more than the width of the muri. Columellae not discernible. Colpi long, apocolpia 5 to 8 μ, colpi covered by narrow, elongate opercula; diorate, ora at or near the ends of the colpi, circular or nearly so, 1·5 to 2·5 μ in diameter, nexine at margin of ora very slightly thickened. Dimensions, equatorial diameter, 21 (24) 29 μ, 14 specimens measured.

COMPARISON: The diorate condition of the colpate apertures makes this form unique among fossil pollen.

HOLOTYPE: Specimen on slide P28079, 23 μ in diameter.

TYPE LOCALITY AND STRATA: Marlin-1 well at 4891-92 ft, *Malvacipollis diversus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone into the Lower *Nothofagidites asperus* Zone, early and middle Eocene.

Genus **Symplocoipollenites** Potonié 1960
Symplocoipollenites austellus Partridge, n. sp.
(Pl. 17, fig. 20)

DESCRIPTION: Pollen isopolar, amb triangular, sides straight to convex, outline in equatorial view broadly ellipitical. Exine up to 1·5 μ thick interradially, nexine about twice as thick as sexine and even thicker behind vestibula. Sexine granulate, granulae less than 0·5 μ in diameter, columellae not discernible. Colpi short, vestibula 6 to 8 μ wide, 2 to 3 μ deep in polar view. Dimensions, 20 (24) 29 μ in diameter, 13 specimens measured.

COMPARISON: The new species differs from *Symplocoipollenites vestibulum* Potonié 1960 by being smaller and by having shorter colpi.

HOLOTYPE: Specimen on slide P29798, 28 μ in diameter.

TYPE LOCALITY AND STRATA: Wurruk-1 well at 426 ft, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: *Triporopollenites bellus* Zone, late Miocene.

Genus **Tricolporites** Cookson 1947
Type Species: **Tricolporites sphaerica** Cookson 1947, p. 195, Pl. 9, figs. 14, 15, text-fig. 4, monotypic when proposed.

DIAGNOSIS (Emended): Pollen free, isopolar, radially symmetrical, tricolporate. Exine variable in thickness and sculpturing. Size variable.

REMARKS: The diagnosis for *Tricolporites* is intentionally broad to accomodate the Australian species described under this name by Cookson (1947), Harris (1965) and those species described herein. This usage incorporates a number of form genera erected subsequently to *Tricolporites* of which many are defined more explicitly on ornament type. A critical appraisal of these genera is beyond the scope of this work.

Tricolporites sphaerica Cookson 1947
(Pl. 18, figs. 5-7)

1947 *Tricolporites sphaerica* Cookson, p. 195, Pl. 9, figs. 14, 15, text-fig. 4.

DESCRIPTION (Revised): Pollen isopolar, suboblate to prolate, amb subtriangular with broadly rounded, incurved apices. Colpi long, indistinct at polar extremities, ora lalongate, 3 to 3·5 μ high, about 6 to 8 μ wide, lateral margins usually obscured by overlying reticulations. Exine 1 to 1·5 μ thick equatorially, up to 3·5 μ thick at the poles, nexine 0·5 to 1·5 μ thick, thicker than sexine with both layers thickest at the poles. Columellae faint but distinct, of uniform height, single, underlie muri of reticulum. Lumina circular to polygonal, 0·5 to 1·5 μ in diameter, mesh commonly smallest around the equator where sexine is thinnest, muri less than 1 μ in width. Dimensions, polar diameter, 20 (26) 31 μ, equatorial diameter 17 (24) 29 μ, 11 specimens measured.

NEOTYPE: Specimen on slide P29875, 29 x 31 μ, selected from topotype material.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone to the *Triporopollenites bellus* Zone, late Eocene through Miocene.

REMARKS: The revised description is based on specimens from topotype material. Although specimens are sparse, there is little likelihood of confusion with other tricolporate species in the assemblages because the only other similar appearing form is an undescribed species with a morphology quite distinct from that of *Tricolporites sphaerica*. There is considerable variability in the shape, the size of the mesh of the reticulum and in the amount of differential thickening of the exine among specimens of *T. sphaerica*. Some specimens are very similar to *T. microreticulatus* Harris 1965 and further study may prove they are conspecific.

Tricolporites angurium Partridge, n. sp.
(Pl. 18, fig. 10)

DESCRIPTION: Pollen isopolar, prolate to subprolate, amb circular. Colpi long, acolpia small, ora generally indistinct, 8 to 10 μ long, equatorial dimension not determined. Exine 1 to 2·5 μ thick, nexine and sexine generally equal in thickness, but either layer may be slightly thicker than the other. Exine thickness constant between poles and equator in equatorial view, becomes less toward apertures in polar view. Sexine reticulate, muri underlain usually by single columellae, lumina less than 0·5 to 1 μ in diameter and of fairly uniform size. Dimensions, polar diameter 34 (39) 46 μ; equatorial diameter 24 (30) 38 μ, 50 specimens measured.

COMPARISON: *Tricolporites angurium* differs from other Australian species of *Tricolporites* by having a delicate, fine-mesh reticulum, long colpi with indistinct ora and a broadly elliptical outline.

HOLOTYPE: Specimen on slide P29845, 41 x 29 μ.

TYPE LOCALITY AND STRATA: Wurruk-1 bore at 3023 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone, middle into late Eocene.

REMARKS: The description is based on a large number of specimens from the type locality. An occasional specimen has double rather than single columellae and some have a slightly thicker exine with a coarser reticulation.

Tricolporites leuros Partridge, n. sp.
(Pl. 19, figs. 5-7)

DESCRIPTION: Pollen isopolar, oblate, poles and equatorial areas tend to be flattened thereby giving the pollen a polygonal outline in equatorial view, amb subcircular. Colpi long, ends bluntly rounded to pointed, ora indistinct, circular, up to 3 μ in diameter. Exine 2 to 4 μ thick in interradial regions, nexine 1·5 to 3 μ thick, both layers become thinner toward the apertures and the sexine is absent in a band about 1·5 μ wide adjacent to the colpi. Sexine psilate, columellae barely discernible. Dimensions, equatorial diameter 20 (26) 40 μ, polar diameter 19 to 23 μ 21 specimens measured.

COMPARISON: *Tricolporites leuros* differs from *T. valvatus* Harris 1972 by being smaller and by the absence of the sexine adjacent to the colpi.

HOLOTYPE: Specimen on slide P29721, 22 μ in diameter.

TYPE LOCALITY AND STRATA: Childers Formation at Moolamoona Coal Mine, top coal seam, *Proteacidites tuberculatus* Zone, early Oligocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, middle Eocene through Miocene.

Tricolporites lilliei (Couper) Stover & Evans 1973
(not illustrated)

1953 *Tricolpites lilliei* Couper, p. 62, Pl. 8, figs. 116, 117.
1960 ———— Couper, Couper, p. 64, Pl. 10, fig. 19.
1973 *Tricolporites lilliei* (Couper) Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Tricolporites lilliei* and *Tricolpites longus* Zones, Late Cretaceous to early Paleocene, possibly middle Paleocene.

Tricolporites paenestriatus Stover, n. sp.
(Pl. 19, fig. 1)

DESCRIPTION: Pollen isopolar, prolate, amb circular. Exine stratification vague to distinct, nexine thin, about 0·5 μ; sexine from 1 μ to slightly more than 1 μ thick, finely rugulate and appearing somewhat striate on some specimens, columellae small, evenly distributed, commonly faint. Apertures colpate or colporate, generally the latter, colpi extend about 3/4 the length of pollen, ora small, lalongate, usually discernible. Dimensions, polar diameter 23 (27) 37 μ; equatorial diameter 14 (19) 28 μ, 21 specimens measured.

COMPARISON: *Tricolporites paenestriatus* differs from *T. angurium* Partridge (this paper) by being smaller and by having the ridges of the sexine aligned to form a rugulate to striate pattern.

HOLOTYPE: Specimen on slide P28050, 31 μ in polar diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 4648 ft, *Malvacipollis diversus* Zone, early Eocene.

STRATIGRAPHIC RANGE: Within the *Lygistepollenites balmei* Zone through the Lower *Nothofagidites asperus* Zone, early Eocene into late Eocene.

Tricolporites retequetrus Partridge, n. sp.
(Pl. 19, figs. 8, 9)

DESCRIPTION: Pollen free or retained in tetrads, free pollen weakly anisopolar, oblate to prolate, amb convexly triangular. Apertures interradial, colpi short to moderately long, apocolpia generally large, pores small and indistinct. Exine psilate at poles, 1·5 to 3 μ thick at apices and becomes thinner towards the apertures. Nexine 0·5 to 2·5 μ thick at the poles, thickest equatorially, sexine thicker than, also thickest equatorially and coarsely reticulate between apertures with large polygonal to labyrinthine lumina and wide muri (2 to 3 μ). Columellae distinct, about 0·5 μ in diameter at the poles, over 1 μ in the apical areas, closely and fairly evenly spaced. Dimension, equatorial diameter 26 (41) 55 μ, polar diameter 20 to 41 μ, 10 individual specimens measured.

COMPARISON: The psilate polar surfaces and coarsely reticulate equatorial areas are diagnostic of *Tricolporites retequetrus* and serve to separate it from other Australian species of *Tricolporites*.

HOLOTYPE: Tetrad on slide P29770, overall diameter 62 μ, individual pollen 34 x 40 μ.

TYPE LOCALITY AND STRATA: Wurruk-1 well at 2898 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: Within the Lower *Nothofagidites asperus* Zone through the *Proteacidites tuberculatus* Zone, late Eocene to early Miocene.

Tricolporites scabratus Harris 1965
(Pl. 19, fig. 2)

1965 *Tricolporites scabratus* Harris, p. 97, Pl. 27, fig. 17.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early Eocene into late Eocene.

Genus **Tubulifloridites** Cookson 1947
Tubulifloridites antipodica Cookson 1947
(Pl. 18, figs. 11, 12)

1947 *Tricolpites* (*Tubulifloridites*) *antipodica* Cookson, p. 138, Pl. 15, fig. 44.
1960 *Tubulifloridites antipodica* Cookson, Potonié, p. 106, Pl. 6, fig. 124.

STRATIGRAPHIC RANGE: *Triporopollenites bellus* Zone, late Miocene.

Polycolpate Pollen

Genus **Nothofagidites** Potonié 1960

COMMENTS: Australian species of *Nothofagidites* are discussed by Cookson (1946, 1959) and by Stover and Evans (1972). These pollen are particularly abundant in middle Eocene and younger assemblages from the Gippsland Basin; however, most of the species have relatively long ranges. Species identified from the Gippsland Basin and their ranges are given below.

Nothofagidites asperus (Cookson) Stover & Evans 1973.

Lower *Nothofagidites asperus* through the *Triporopollenites bellus* Zone, middle Eocene through Miocene.

Nothofagidites brachyspinulosus (Cookson) Harris 1965.

Lygistepollenites balmei Zone through the *Triporopollenites bellus* Zone, middle Paleocene through Miocene.

Nothofagidites deminutus (Cookson) Stover & Evans 1973.

Within upper part of *Malvacipollis diversus* Zone through the *Triporopollenites bellus* Zone, early Eocene through Miocene.

Nothofagidites emarcidus (Cookson) Harris 1965

Malvacipollis diversus through the *Triporopollenites bellus* Zone early Eocene through Miocene.

Nothofagidites endurus Stover & Evans 1973

Tricolporites lilliei Zone into the *Malvacipollis diversus* Zone, Late Cretaceous into early Eocene.

Nothofagidites falcatus (Cookson) Stover & Evans 1973.

Lower *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, middle Eocene through Miocene.

Nothofagidites flemingii (Couper) Potonié 1960.

Lygistepollenites balmei Zone into the *Proteacidites tuberculatus* Zone, late Paleocene through Oligocene.

Nothofagidites goniatus (Cookson) Stover & Evans 1973.

Within upper part of *Malvacipollis diversus* Zone into the *Proteacidites tuberculatus* Zone, early Eocene through Oligocene.

Nothofagidites heterus (Cookson) Stover & Evans 1973.

Within upper part of *Malvacipollis diversus* Zone through the *Triporopollenites bellus* Zone, early Eocene through Miocene.

Nothofagidites senectus Dettmann & Playford 1968.
Nothofagidites senectus Zone into the *Tricolpites longus* Zone, Late Cretaceous (Senonian) to early Paleocene.

Nothofagidites vansteenisii (Cookson) Stover & Evans 1973.

Lower *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, middle Eocene through Miocene.

Genus **Polycolpites** Couper 1953
Polycolpites esobalteus McIntyre 1968
(Pl. 20, figs. 10, 11)

1968 *Polycolpites esobalteus* McIntyre, p. 197, figs. 67-69.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through *Triporopollenites bellus* Zone, early Eocene through Miocene.

Polycolpites langstonii Stover, n. sp.
(Pl 20, fig. 12)

DESCRIPTION: Stephanocolpate, subspherical, amb circular; exine stratification indistinct, nexine extremely thin (less than 0·5 μ), occasionally separated from sexine and appearing as a wrinkled, internal membrane. Sexine about 3 μ thick, homogeneous, psilate, without columellae. Colpi long, unmodified, number 6 to 8, commonly 7. Dimensions, 50 (54) 63 μ, measured on 11 randomly oriented specimens.

COMPARISON: *Polycolpites langstonii* differs from *P. esobalteus* McIntyre 1968 by being considerably larger, and by having a thicker exine and fewer colpi.

HOLOTYPE: Specimen on slide P28055, 52 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 4937 ft, *Lygistepollenites balmei* Zone. late Paleocene.

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone, middle to late Paleocene.

Polycolpites reticulatus Couper 1960
(Pl. 20, fig. 7)

1960 *Polycolpites reticulatus* Couper, p. 63, Pl. 10, figs. 6, 7.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, late Eocene through Miocene.

Genus **Psilastephanocolporites** Leidelmeyer 1966
Psilastephanocolporites micus Partridge, n. sp.
(Pl. 20, figs. 3-6)

DESCRIPTION: Pollen isopolar, oblate, amb circular to slightly polygonal, stephanocolporate. Apertures 6 to 8, usually 7, colpi short, indistinct, ora distinct, circular, 2·5 μ in diameter. Exine less than 1 μ thick, nexine very thin, loosely attached to indistinct, rather widely spaced columellae. Tectum perforate, scabrate or rarely with low indistinct granulae. Dimensions, equatorial diameter 16 (24) 30 μ, 12 specimens measured.

COMPARISON: No similar appearing pollen known from the Tertiary of southeastern Australia.

HOLOTYPE: Specimen on slide P29851, 25 μ in diameter.

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TYPE LOCALITY AND STRATA: Yallourn Open Cut, Victoria, Yallourn Seam along north wall of cut, 80 ft above base of the seam, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: Upper part of *Proteacidites tuberculatus* Zone through the *Triporopollenites bellus* Zone, early and late Miocene.

Tetracolporate Pollen

Genus **Sapotaceoidaepollenites** Pontonié, Thomson & Thiergart 1950

Sapotaceoidaepollenites rotundus Harris 1972
(Pl. 20, fig. 13)

1972 *Sapotaceoidaepollenites rotundus* Harris, p. 56, figs. 17, 18

STRATIGRAPHIC RANGE: *Proteacidites asperopolus* Zone through the *Triporopollenites bellus* Zone, early Eocene through Miocene.

Genus **Tetracolporites** Couper 1953
Tetracolporites verrucosus Stover, n. sp.
(Pl. 20, figs. 1, 2)

1973 *Tetracolporites* sp. A, Stover & Evans (in press).

DESCRIPTION: Pollen isopolar, amb circular to subquadrangular, outline ellipsoidal in equatorial view, slightly longer than wide. Exine stratification indistinct, nexine very thin, not discernible in some specimens, sexine clavate, clavae about 1 μ high, 1 to 2·5 μ in diameter, closely spaced so as to give the appearance of a negative reticulum in plan view. Apertures colporate, colpi extend about 3/4 length of pollen, bordered by narrow margoes on some specimens, ora circular to slightly lolongate, commonly obscure and observed most commonly on damaged specimens. Dimensions, length 31 (35) 39 μ, width 23 (27) 37 μ, 11 specimens measured.

COMPARISON: *Tetracolporites verrucosus* differs from *T. oamaruensis* Couper 1953 by being verrucate and by having a circular rather than a rectangular amb and a thinner exine.

HOLOTYPE: Specimen on slide P28082. equatorial diameter 28 μ.

TYPE LOCALITY AND STRATA: Marlin-2 well at 8121 ft, Latrobe Group, *Lygistepollenites balmei* Zone, late Paleocene.

STRATIGRAPHIC RANGE: *Tricolpites longus* Zone into the *Lygistepollenites balmei* Zone, early and middle Paleocene, possibly into the late Paleocene.

Monoporate Pollen

Genus **Aglaoreidia** Erdtman 1960
Aglaoreidia qualumis Partridge, n. sp.
(Pl. 20, figs. 8, 9)

1973 *Aglaoreidia* sp. A, Stover & Evans (in press).

DESCRIPTION: Pollen monoporate, spherical to ellipsoidal, specimens commonly folded. Exine 0·5 to 1·0 μ thick, nexine thinner than sexine; sexine reticulate, muri delicate, narrow, and underlain by single columellae; lumina polygonal, fairly uniform in size, 1·0 to 1·5 μ in diameter, smaller lumina may occur at intersections of some muri. Pore circular, 2 to 2·5 μ in diameter, nexine thickened adjacent to pore, forming an annulate ring about 2 μ wide. Rcticulum extends to pore margin. Diameter 20 (28) 35 μ, 17 specimens measured.

COMPARISON: *Aglaoreidia qualumis* differs from *A. cyclops* Erdtman 1960 by having the mesh of the reticulum fairly uniform in size whereas on *A. cyclops* the lumina are conspicuously smaller across the narrow ends of the pollen and apparently in the proximal polar area as well. The new species is also smaller than *A. cyclops* and has a smaller pore.

HOLOTYPE: Specimen on slide P29827, 32 μ in diameter.

TYPE LOCALITY AND STRATA: Rosedale-1 well at 2098-2100 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: Upper part of Lower *Nothofagidites asperus* Zone into the lower part of the *Proteacidites tuberculatus* Zone; late Eocene to early Oligocene.

Genus **Milfordia** Erdtman emended Partridge

1960 *Milfordia* Erdtman, p. 46.
1966 *Monulcipollenites* Fairchild *in* Stover, Elsik & Fairchild, p. 2, 3.
1968 *Restioniidites* Elsik, p. 313.

Type Species: **Milfordia hypolaenoides** Erdtman 1960, monotypic when proposed.

DIAGNOSIS (Emended): Pollen spherical to ellipsiodal, monoaperturate, porate or ulcate. Aperture variable, small to large, circular to elliptical, annulate or with irregular, ragged margin. Sexine about as thick as nexine, former foveolate, punctate or scrobiculate.

REMARKS: The aperture on the holotype is interpreted as ulcate rather than colpate, which automatically makes *Restioniidites* Elsik a synonym of *Milfordia*. Elsik (1968), in addition to diagnosing *Restioniidites* as incorporating monulcoid pollen, pointed out that the aperture type varies from porate and with or without an annulus to ulcate with irregular, broken margins.

Milfordia homeopunctata (McIntyre) Partridge n. comb.
(Pl. 21, figs. 10, 11)

1965 *Monoporopollenites homeopunctatus* McIntyre, p. 206, figs. 4, 5.

STRATIGRAPHIC RANGE: Within the *Malvacipollis diversus* Zone through the *Triporopollenites bellus* Zone, early Eocene through Miocene.

REMARKS: Specimens of *Milfordia homeopunctata* have an equatorial diameter of 21 (35) 47 μ and occur consistently only in the youngest zone.

Diporate Pollen

Genus **Banksieaeidites** Cookson ex Couper 1954
Banksieaeidites arcuatus Stover, n. sp.
(Pl. 21, figs. 2-4)

DESCRIPTION: Pollen biaperturate, anisopolar, outline in equatorial view asymmetrical, one side strongly convex, opposite side straight or nearly so. Nexine thicker than sexine, exine layering clearly differentiated to obscure, usually distinct adjacent to the pores where the nexine is thickened slightly; exine 1 to 1·5 μ thick, sculpturing very finely puncto-reticulate. Pores about 3 μ in diameter, one at each narrow end of the pollen and each with encircling collar approximately 2 μ wide. Dimensions, 23 (27) 32 μ in length; 15 to 19 μ in height, 15 specimens.

COMPARISON: *Banksieaeidites arcuatus* differs from the type species, *B. elongatus*, by being smaller, by having smaller apertures and one strongly convex surface.

HOLOTYPE: Specimen on slide P28049, 25 x 16 μ.

TYPE LOCALITY AND STRATA: Bass-2 well at 4308 ft, *Proteacidites asperopolus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early, middle and late Eocene.

Banksieaeidites elongatus Cookson 1950
(not illustrated)

1950 *Banksieaeidites elongatus* Cookson, p. 170, Pl. 1, fig. 10.
1950 *Banksieaeidites minimus* Cookson, p. 169, Pl. 1, figs. 8, 9.
1954 *Banksieaeidites cf. elongatus* Cookson, Couper, p. 480, text-fig. 1, fig. 3.
1960 *Banksieaeidites minimus* Cookson Potonié p. 113, Pl. 7, fig. 140.
1960 *Banksieaeidites elongatus* Cookson, Harris, p. 90, Pl. 27, fig. 23.

STRATIGRAPHIC RANGE: Within the *Lygistepollenites balmei* Zone through the *Triporopollenites bellus* Zone, late Paleocene through Miocene.

REMARKS: Cookson (1950) separated *Banksieaeidites minimus* from *B. elongatus* on the difference in size between the two forms. Because intermediate size specimens occur in Gippsland Basin assemblages, and in fact are more common than the larger or smaller specimens, *B. minimus* and *B. elongatus* are interpreted as one species with the following size range: length 21 (37) 45 μ, width, 18 (23) 28 μ, pore diameter, 9 to 18 μ. The lectotype illustrated by Cookson (1950, Pl. 1, fig. 10) is on slide P29710, and the specimen also illustrated by Cookson (1950, Pl. 1, fig. 9) is on slide P29709.

Genus **Granodiporites** Varma & Rawat 1963
Granodiporites nebulosus Partridge, n. sp.
(Pl. 21, fig. 1)

DESCRIPTION: Pollen anisopolar, amb elliptical, end truncated, lateral view plano-convex. Pores 3 to 11 μ in diameter, simple or with beaded lip at edge of nexine; exine 1·5 to 2·5 μ thick, nexine 1 to 1·5 μ thick, thicker than sexine, latter rugulate to striate, ridges and grooves less than 1 μ wide, sexinal surface with widely spaced low granulae less than 1 μ in diameter. Dimensions, 40 (49) 78 μ in length, polar diameter 23 (29) 40 μ, 9 specimens measured.

COMPARISON: Of the species of *Granodiporites* described by Varma and Rawat (1963) *G. nebulosus* differs from *G. piercei* and *G. sahnii* by having simple pores, and from *G. erdtmanii* by having proportionally smaller pores. The granulate sculpturing and lack of collars around the apertures distinguish *G. nebulosus* from species of *Banksieaeidites.*

HOLOTYPE: Specimen on slide P29732, 78 x 40 μ.

TYPE LOCALITY AND STRATA: Loy Yang-842 bore at 483-486 ft, *Proteacidites tuberculatus* Zone, early Oligocene.

STRATIGRAPHIC RANGE: Upper *Nothofagidites asperus* Zone into the basal part of the *Proteacidites tuberculatus* Zone, late Eocene and early Oligocene.

Triporate Pollen

Genus **Gamblerina** Harris 1972
Gambierina edwardsii (Cookson & Pike) Harris 1972
(Pl. 21, fig. 9)

1954 *Triorites edwardsii* Cookson & Pike, p. 214, Pl. 2, figs. 101, 105, 106 (not figs. 102-104, 107).
1965 ———— Cookson & Pike, Harris, p. 94, Pl. 28, fig. 1.
1968 ———— Cookson & Pike, Dettmann & Playford, p. 86, Pl. 8, fig. 21.

1972 *Gambierina edwardsii* (Cookson & Pike), Harris, p. 55, fig. 12, (re-illustration of specimen shown in Harris, 1965).

LECTOTYPE: Specimen on slide P29664, and illustrated by Cookson & Pike (1954, Pl. 2, fig. 101).

TYPE LOCALITY AND STRATA: Lal Lal-51 bore at 398 ft, *Lygistepollenites balmei* Zone equivalent, middle to late Paleocene.

STRATIGRAPHIC RANGE: Within *Tricolporites lilliei* Zone into the *Lygistepollenites balmei* Zone, Late Cretaceous to late Paleocene.

Gambierina rudata Stover, n. sp.
(Pl. 21, fig. 8)

1954 *Triorites edwardsii* Cookson & Pike, p. 214, Pl. 2, figs. 102-104, 107 (not figs. 101, 105, 106).
1968 *aff. Triorites edwardsii* Cookson & Pike, Dettmann & Playford, p. 86, Pl. 8, fig. 20.
1973 *Triorites edwardsii* Cookson & Pike, Stover & Evans (in press).

DESRIPTION: Pollen isopolar, amb triangular to concavely triangular, apices moderately rounded, occasionally angular. Exine 1·5 to 2·5 μ thick, nexine thicker than sexine, stratification commonly indistinct except at the apertures where the thin, ill-defined columellate layer is usually discernible, sexine psilate or faintly and indistinctly sculptured. Triradiate band of darkened exine, centred at the poles and with its rays extending into the interradial areas, occurs on some specimens. Apertures about 1·5 μ wide, 3 to 4 μ deep as seen in polar view, with the exine 3 to 4 μ thick next to the apertures, and lacking conspicuous 'nick' point. Dimensions, 25 (29) 34 μ in diameter, 20 specimens measured.

COMPARISON: *Gambierina rudata* is similar to *G. edwardsii* (Cookson & Pike) Harris; however, specimens of the latter have more deeply concave sides and somewhat straight rather than rounded apices, and smaller diameters. On most specimens of *G. edwardsii,* the 'nick' point within the aperture is well defined and an indentation is present at the middle of each interradial margin. Both of these features are either lacking or very poorly expressed on specimens of *G. rudata.* In addition, the exine at the apertures is thinner on specimens of *G. rudata* than on those of *G. edwardsii.*

HOLOTYPE: Specimen on slide P28063, 29 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 5508 ft, *Lygistepollenites balmei* Zone, late Paleocene.

STRATIGRAPHIC RANGE: *Nothofagidites senectus* Zone through the *Lygistepollenites balmei* Zone, Late Cretaceous (Senonian) to late Paleocene.

REMARKS: In the Gippsland Basin, *Gambierina rudata* is by far more abundant than *G. edwardsii,* and is particularly common within the *Tricolpites longus* Zone.

Genus **Proteacidites** Cookson ex Couper 1953
Proteacidites adenanthoides Cookson 1950
(Pl. 22, figs. 7, 8)

1950 *Proteacidites adenanthoides* Cookson, p. 172, 173, Pl. 2, fig. 21.
1953 ———— Cookson, Couper, p. 42, Pl. 9, fig. 137.
1953 ———— Cookson, Cookson, p. 467, Pl. 1, fig. 20.
1965 ———— Cookson, Harris, p. 91, Pl. 28, fig. 9.

COMMENTS ON THE LECTOTYPE: The slide containing the lectotype has been given the accession number P29669. The specimen is complete and excellently preserved, is slightly anisopolar with clearly differentiated exine, particularly along the interradial equatorial margin. Exine is slightly over 3 μ thick interradially, with the nexine about twice as thick as the sexine, both layers thin towards the apertures, around which the nexine is very thin to indistinguishable. Surface in non-apertural areas finely reticulate, lumina circular, elongate or chevron-shaped, occupy slightly less area than muri, columellae beneath muri singular and fairly regularly distributed. Reticulation finer in apertural areas, essentially puncto-reticulate, columellae indistinct. Pores concave in polar view, about 6 μ wide. Diameter 73 x 74·5 μ.

STRATIGRAPHIC RANGE: Upper part of *Lygistepollenites balmei* Zone through the Lower *Nothofagidites asperus* Zone, late Paleocene into late Eocene.

REMARKS: On some specimens the mesh of the reticulation is larger on one surface than on the other, but not appreciably so. The difference is expressed by an increase in the size of the lumina. In addition, the nexine may thin only at the pores and maintain a constant thickness as seen along the equatorial margin. Size range is 44 to 75 μ in diameter; columellae tend to be indistinct on specimens less than 50 μ in diameter.

TYPE LOCALITY AND STRATA: Wensleydale, Victoria, about 10 miles NW. of Anglesea. lignite clay, Eocene, probably early Eocene, zone equivalent uncertain.

Proteacidites alveolatus Stover n. sp.
(Pl. 22, figs. 1, 2)

DESCRIPTION: Pollen isopolar to slightly anisopolar, amb triangular with slightly convex to slightly concave sides. Exine stratification usually distinct; nexine 1 to 1·5 μ thick, tends to be indistinct in and around apertures, sexine about 1 μ thick, reticulate, muri 2 to 2·5 μ wide and outline somewhat circular to elliptical lamina 2·5 μ in length, mesh smaller towards apertures. Muri with widely scattered perforations less than 1 μ in diameter. Columellae more or less evenly distributed beneath muri, absent below lumina. Apertures porate, equatorial, concave in polar view, 3 to 5 μ across. Dimensions, 32 (38) 42 μ in diameter, 13 specimens measured.

COMPARISON: *Proteacidites alveolatus* differs from *P. kopiensis* Harris 1972 and *P. pseudomoides* Stover (this paper) by having wider muri so that a greater portion of the pollen surface is taken up by the muri than by the lumina. The new species has a thicker exine than *P. pseudomoides* and the lumina are not conspicuously larger in the interradial areas as in *P. kopiensis.*

HOLOTYPE: Specimen on slide P28076, 40 μ in diameter.

TYPE LOCALITY AND STRATA: Marlin-3 well at 5088 ft, Latrobe Group, *Proteacidites asperopolus* Zone, early Eocene.

STRATIGRAPHIC RANGE: Upper part of *Malvacipollis diversus* Zone into the lower part of the Lower *Nothofagidites asperus* Zone, early and middle Eocene.

Proteacidites amolosexinus Dettmann & Playford 1968
(not illustrated)

1968 *Proteacidites amolosexinus* Dettmann & Playford, p. 87, Pl. 8, figs. 15-18.

STRATIGRAPHIC RANGE: *Nothofagidites senectus* through *Tricolpites longus* Zones, Late Cretaceous to early Paleocene, possibly middle Paloecene.

Proteacidites angulatus Stover, n. sp.
(Pl. 22, figs. 5, 6)

DESCRIPTION: Pollen usually isopolar, occasional specimens slightly anisopolar; amb triangular, apices somewhat protrusive, truncated, sides straight to slightly convex. Exine clearly stratified; nexine 1 to 1·5 μ thick, uniform in thickness or thinner at apertures, sexine about as thick as nexine, columellate layer and ectosexine of approximately equal thickness. Sexine reticulate over most of the pollen surface, puncto-reticulate in apertural areas, lumina and muri small, usually less than 1 μ in width, fairly regular in size. Pores shallowly concave in polar view, 3 to 5 μ in width. Dimensions, 23 (30) 34 μ, 12 specimens measured.

COMPARISON: *Proteacidites angulatus* differs from *P. reticuloscabratus* Harris 1965 by having protrusive, nonscabrate apertural areas, a smaller mesh reticulum and a generally smaller size.

HOLOTYPE: Specimen on slide P28091, 30 μ in diameter.

TYPE LOCALITY AND STRATA: Barracouta-1 well at 7251 ft, Latrobe Group, *Lygistepollenites balmei* Zone, middle Paleocene.

STRATIGRAPHIC RANGE: *Tricolpites longus* into the *Lygistepollenites balmei* Zone, early and middle Paleocene.

Proteacidites annularis Cookson 1950
(not illustrated)

1950 *Proteacidites annularis* Cookson, p. 170, Pl. 1, fig. 15.
1953 ——— Cookson, Couper, p. 42, Pl. 5, fig. 52.
1953 *Proteacidites granulatus* Cookson, p. 467, Pl. 1, fig. 23.
1953 *Proteacidites annularis* Cookson, Cookson, p. 466, Pl. 1, fig. 19.
1960 ——— Cookson, Couper, p. 49, Pl. 5, figs. 11, 12.
1965 ——— Cookson, Harris, p. 92, Pl. 28, figs. 12, 13.
1973 ——— Cookson, Stover & Evans, (in press).

STRATIGRAPHIC RANGE: *Lygistepollenites balmei* Zone through the *Triporopollenites bellus* Zone, middle Paleocene through Miocene.

REMARKS: In 1950 Cookson described in detail the apertures and internal exine morphology of *Proteacidites annularis.* Three years later she reiterated the characteristics of *P. annularis* and in the same publication (Cookson, 1953) named a new species, *P. granulatus.* Based on the examination of 50 well preserved specimens from the Gippsland Basin and on comparisons with the specimens illustrated by Cookson in 1950 and 1953, the two forms are conspecific. Because *P. annularis* has priority over *P. granulatus,* the former name is applied to specimens that range in size between 25 and 50 μ, have distinct apertural collars, and a finely granulate to irregularly scabrate sexine.

Proteacidites asperopolus Stover & Evans 1973
(Pl. 26, fig. 2)

1973 *Proteacidites asperopolus* Stover & Evans (in press).

STRATIGRAPHIC RANGE: Upper part of *Malvacipollis diversus* Zone into the lower part of the Lower *Nothofagidites asperus* Zone, early Eocene into middle Eocene.

Proteacidites beddoesii Stover, n. sp.
(Pl. 22, figs. 3, 4)

DESCRIPTION: Pollen isopolar, amb triangular, sides straight to slightly convex. Exine stratification distinct, nexine thicker than or as thick as sexine, exine 1·5 μ thick between apertures, slightly thinner around apertures on some specimens. Columellate layer composed of dense, evenly distributed, minute columellae that in polar view provide a faint, granular pattern, outer exinal surface with small, scattered apiculae. Pores about 3 μ wide in polar view, nexine roughened and/or thickened slightly around pores on some specimens. Dimensions, 20 (24) 30 μ in diameter, 22 specimens measured.

COMPARISON: *Proteacidites beddoesii* differs from *P. parvus* Cookson 1950 by having an apiculate sexine, a convexly triangular equatorial outline and generally some scabration within the apertures.

HOLOTYPE: Specimen on slide P28049, 25 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 4308 ft, *Proteacidites asperopolus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early to late Eocene.

Proteacidites crassus Cookson 1950
(Pl. 22, fig. 9)

1950 *Proteacidites crassus* Cookson, p. 173, Pl. 2, fig. 22.

COMMENTS: The lectotype is strongly anisopolar, reticulate, muri 1 to 1·5 μ wide and lumina from 0·5 to 2·5 μ in length. The columellae beneath the muri are distinct, single or paired, closely spaced, and the pores are about 5 μ wide as seen in polar view. Other morphologic features are as described by Cookson (1950).

LECTOTYPE: Specimen on slide P29695, 63 μ in diameter and illustrated by Cookson (1950, Pl. 2, fig. 22), here designated.

TYPE LOCALITY AND STRATA: Moorlands Coalfield, South Australia, Moorlands lignite member of Renmark Beds, late Eocene, Lower *Nothofagidites asperus* Zone equivalent.

STRATIGRAPHIC RANGE: *Proteacidites asperopolus* Zone through the Lower *Nothofagidites asperus* Zone, early to late Eocene.

Proteacidites grandis Cookson 1950
(Pl. 23, fig. 3)

1950 *Proteacidites grandis* Cookson, p. 173, Pl. 2, fig. 23.
1965 *Proteacidites dilwynensis* Harris, p. 93, Pl. 28, figs. 27, 28.
1973 ——— Harris, Stover & Evans (in press).

COMMENTS: The lectotype is here designated as the specimen illustrated by Cookson (1950) and located on slide P29669. The muri of the sexinous reticulum are about 1 μ wide and the lumina are irregularly shaped with their greatest dimension being from 2 to 4 μ. Muri supported by single and paired, rather closely spaced columellae which become denser towards the apertures as the size of the lumina is decreased. The mesh of the reticulum is very fine around the apertures as illustrated by Harris (1965, Pl. 28, fig. 28). Lectotype is 80 x 84 μ in diameter.

Specimens of *Proteacidites grandis* tend to be slightly anisopolar and the reticulation at one pole may be fractionally larger than on the other pole. Shape of the pollen in polar view varies from moderately to strongly concavely triangular.

TYPE LOCALITY AND STRATA: Wensleydale, Victoria, about 10 miles NW. of Anglesea, lignitic clay, Eocene, probably early Eocene, zone equivalent unknown.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* and *Proteacidites asperopolus* Zones, early Eocene.

Proteacidites incurvatus Cookson 1950
(Pl. 25, fig. 8)

1950 *Proteacidites incurvatus* Cookson, p. 171, Pl. 2, figs. 25, 26.
1965 ——— Cookson, Harris, p. 92, Pl. 28, fig. 5.

DESCRIPTION (Revised): Pollen isopolar, amb concavely triangular with moderately rounded apices. Exine stratification distinct, exine 6 μ thick in interradial—equatorial areas, 4 μ thick at apertures; nexine and sexine approximately equal in thickness. Columellae dense, relatively small, psilate, tips of adjacent columellae commonly coalesced to form low granulae, tuberculae or rounded verrucae from slightly less than 1 μ to 6 μ in diameter, sculpturing uniform or variable on individual specimens, coarser sculpturing usually in the polar and/or interradial areas. Pores 8 to 14 μ wide, outer margin concave in polar view. Dimensions, 63 (75) 102 μ in diameter, 10 specimens measured.

LECTOTYPE: Specimen on slide P29693, and illustrated by Cookson (1950, Pl. 2, fig. 25) 96 x 102 μ.

TYPE LOCALITY AND STRATA: Moorlands Coalfield, South Australia, Moorlands lignite member of Renmark Beds, late Eocene.

STRATIGRAPHIC RANGE: Upper part of *Lygistepollenites balmei* Zone into the Lower *Nothofagidites asperus* Zone, late Paleocene through middle Eocene.

Proteacidites kopiensis Harris 1972
(not illustrated)

1972 *Proteacidites kopiensis* Harris, p. 57, figs. 26, 27.
1973 *Proteacidites* sp. B, Stover & Evans, (in press).

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone into the Lower *Nothofagidites asperus* Zone, early Eocene into late Eocene.

Proteacidites latrobensis Harris 1966
(Pl. 25, fig. 5)

1965 *Proteacidites crassipora* Harris, p. 93, Pl. 28, figs. 24, 25.
1966 *Proteacidites latrobensis* Harris, p. 332.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early to late Eocene.

REMARKS: Specimens of *Proteacidites latrobensis*, including the holotype, have scattered apiculae on the sexine; the presence of apiculae is characteristic and one of the diagnostic features of the species.

Proteacidites leightonii Stover, n. sp.
(Pl. 23, figs. 1, 2)

1965 *Proteacidites grandis* Cookson, Harris, p. 92, Pl. 29, fig. 1.
1973 ——— Cookson, Stover & Evans, (in press).

DESCRIPTION: Pollen isopolar to anisopolar, amb concavely triangular; exine clearly stratified, exine 5 to 6 μ thick between apertural areas, about 4 μ thick around apertures; sexine thicker than nexine except around apertures where the sexine and nexine are of approximately equal thickness. Sexine coarsely reticulate, lumina and muri psilate, muri 1·5 to 2 μ wide, narrower around apertures, outline of lumina irregular, size variable, 2 to 15 μ in length, average about 6 μ, lumina tend to be larger at one polar area. Columellae underlie muri, absent within lumina, single or paired, closely spaced. Apertures slightly concave in polar view, about 6 μ wide. Dimensions, 62 (66) 75 μ in diameter, 25 specimens measured.

COMPARISON: *Proteacidites leightonii* differs from *P. grandis* Cookson 1950 by having a larger mesh reticulation and a thicker exine, and from *P. reticulatus* by being larger.

HOLOTYPE: Specimen on slide P28049, 63 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 4308 ft, *Proteacidites asperopolus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* through Lower *Nothofagidites asperus* Zone, early Eocene to late Eocene.

REMARKS: Medium to large size, generally reticulate proteaceous pollen are a conspicuous component of early Eocene palynomorph assemblages from the Latrobe Group. These pollen are more or less typified by *Proteacidites leightonii.* Smaller specimens with the same morphology have been identified as *P. reticulatus.* Although Harris (1965) states what he believes are the distinguishing differences among *P. leightonii* (as *P. grandis*), *P. grandis* (as *P. dilwynensis*) and *P. ornatus* Harris 1965, intermediate forms occur, and it is frequently difficult to consistently separate these three species with reasonable confidence. Retention of the three species is justified because each has a different stratigraphic range.

Proteacidites ornatus Harris 1965
(not illustrated)

1965 *Proteacidites ornatus* Harris, p. 83, Pl. 28, figs. 22, 23, 24.

STRATIGRAPHIC RANGE: Upper part of the *Malvacipollis diversus* Zone and the *Proteacidites asperopolus* Zone, early Eocene.

Proteacidites obscurus Cookson 1950
(Pl. 25, fig. 4)

1950 *Proteacidites obscurus* Cookson, p. 175, Pl. 3, figs. 30, 31.
1972 *Proteacidites varius* Harris, p. 58, figs. 39-42.

LECTOTYPE: Specimen on slide P29694, and illustrated by Cookson (1950, Pl. 3, fig. 30).

TYPE LOCALITY AND STRATA: Moorlands Coalfield, South Australia, Moorlands lignite member of the Renmark Beds, late Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the *Triporopollenites bellus* Zone, early Eocene to late Miocene.

REMARKS: The sexine appears to be attached weakly to the nexine because specimens are commonly found in which the sexine is stripped with only remnants remaining, usually around the apertures.

Proteacidites pachypolus Cookson & Pike 1954
(Pl. 26, fig. 1)

1954 *Proteacidites pachypolus* Cookson & Pike, p. 208, Pl. 2, figs. 64-66.
1954 ——— Cookson & Pike, Cookson, fig. 2a.
1965 ——— Cookson & Pike, Harris, p. 91, Pl. 28, fig. 7.
1973 ——— Cookson & Pike, Stover & Evans, (in press).

LECTOTYPE: Specimen on slide P29678 and illustrated by Cookson and Pike (1954, Pl. 2, fig. 64), 39 μ in diameter.

TYPE LOCALITY AND STRATA: South Australian Department of Mines Canopus Station-1 bore, carbonaceous sandstone at 881-910 ft, Eocene.

STRATIGRAPHIC RANGE: Upper part of *Malvacipollis diversus* Zone into the Lower *Nothofagidites asperus* Zone, early Eocene into the late Eocene.

REMARKS: Another specimen of *Proteacidites pachypolus* illustrated by Cookson and Pike (1954, Pl. 2, fig. 66) is on slide P29654.

Proteacidites palisadus Couper 1953
(not illustrated)

1953 *Proteacidites palisadus* Couper, pp. 42, 43, Pl. 5, fig. 54.
1960 ——— Couper, Couper, p. 49, Pl. 5, fig. 17.
1973 ——— Couper, Stover and Evans, (in press).

STRATIGRAPHIC RANGE: *Tricolporites lilliei* Zone into the *Tricolpites longus* Zone, late Cretaceous into early Paleocene.

REMARKS: In size and exine thickness, the Australian specimens are intermediate between those of *P. palisadus* and *P. subpalisadus* Couper 1953. The specimens are assigned to *P. palisadus* because the exine thickness (2 to 3·5 μ) is more similar to that for this species than for *P. subpalisadus.*

Proteacidites pseudomoides Stover, n. sp.
(Pl. 25, fig. 3)

DESCRIPTION: Pollen isopolar to slightly anisopolar, amb triangular, sides straight or very gently concave. Exine stratification distinct, nexine and sexine about equally thick, exine 1 μ or slightly more than 1 μ, nexine may be thinner around the apertures than between them. Columellae indistinct, sexine reticulate, muri narrow, about 0·5 μ wide, lumina circular to polygonal, 0·5 to 2 μ in diameter, tend to be coarsest near the equator between apertural areas. Pores concave in polar view, 4 to 5 μ across. Dimensions, 27 (31) 36 μ, 30 specimens measured.

COMPARISON: *Proteacidites pseudomoides* differs from *P. symphyonemoides* Cookson 1950 by having a thinner exine, an indistinct columellate layer, and a more irregularly shaped, generally smaller meshed reticulum. Although the lumina of *P. pseudomoides* may be coarser interradially, the lumina do not approach the size of those developed on *P. kopiensis* Harris 1972.

HOLOTYPE: Specimen on slide P28074, 30 μ in diameter.

TYPE LOCALITY AND STRATA: Marlin-3 well at 5127 ft, Latrobe Group, *Proteacidites asperopolus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* into the *Proteacidites tuberculatus* Zones, early Eocene into early Oligocene.

Proteacidites recavus Partridge, n. sp.
(Pl. 24, fig. 4, 5)

DESCRIPTION: Pollen slightly anisopolar, amb triangular, sides moderately concave to straight, apices broadly rounded. Exine 3 to 4 μ thick interradially, thinner around apertures, sexine thinner than nexine, latter 2 to 4 μ thick interradially, slightly recurved at pores, sexine reticulate, muri 0·5 to 1 μ wide, labyrinthine, in some areas discontinuous, segments straight or curved. Lumina irregular, greatest dimension 1·5 to 3 μ, columellae beneath muri singular, vague to distinct. Mesh of reticulum largest in polar areas, smallest around apertures. Pore margins shallowly concave in polar view, pores 8 to 13 μ wide. Dimensions, 52 (59) 80 μ, 10 specimens measured.

COMPARISON: *Proteacidites recavus* differs from *P. incurvatus* Cookson 1950 and *P. stipplatus* Partridge (this paper) by having a reticulate sexine; from the latter only *P. recavus* differs by having predominantly concave sides and the exine recurved slightly at the apertures.

HOLOTYPE: Specimen on slide P29860, 52 μ in diameter.

TYPE LOCALITY AND STRATA: Coolungoolun-1 bore at 290 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone, middle and late Eocene.

Proteacidites rectomarginis Cookson 1950
(Pl. 23, figs. 6-8)

1950 *Proteacidites rectomarginis* Cookson, pp. 174, 175, Pl. 2, fig. 27.
1972 *Proteacidites clintonensis* Harris, p. 57, figs. 30-34.

DESCRIPTION (Revised): Pollen isopolar, amb triangular with straight to slightly concave sides with slightly truncated apices. Exine 3 to 5 μ thick, nexine 1·5 to 2·5 μ interradially, up to 3·5 μ thick at apertures where it is disrupted by grooves and punctae, imparting a ragged appearance to a zone up to 10 μ wide around the apertures. Sexine tectate, 1·5 to almost 2 μ thick, of uniform thickness, columellae distinct, single, about 0·5 μ in diameter and 0·5 to 1·5 μ apart. Sexine above tectum granulate to verrucate, latter 0·5 to 3 μ in diameter (average 1·5 to 2 μ), of fairly constant size on individual pollen, shape variable, separated by narrow grooves which together with the verrucae form a negative reticulum; grooves with fine punctae which pierce the tectum. Usually triporate, occasional specimens di- or tetraporate, pores 8 to 14 μ wide in polar view, outline ragged. Dimensions, 40 (53) 60 μ, 24 specimens measured.

COMPARISON: *Proteacidites rectomarginis* is similar to *P. incurvatus*; the latter differs by having rounded, slightly incurved apices, the exine thinning rather than thickening toward the apertures and by having the suprategillar sculpturing distinctly coarser in the interradial areas than over the rest of the pollen surface.

LECTOTYPE: Specimen on slide P29657, 84 μ in diameter and illustrated by Cookson (1950, Pl. 2, fig. 27).

TYPE LOCALITY AND STRATA: Lucifer Mine, 0·5 miles SE. of Bacchus Marsh railway station, Victoria, Maddingley seam, *Proteacidites tuberculatus* Zone equivalent, early Miocene.

STRATIGRAPHIC RANGE: Within Lower *Nothofagidites asperus* Zone into the *Triporopollenites bellus* Zone, late Eocene into late Miocene.

REMARKS: The revised description is based on the study of topotype specimens as well as material from the Gippsland Basin.

Proteacidites reflexus Partridge, n. sp.
(Pl. 24, fig. 6)

DESCRIPTION: Pollen slightly anisopolar, amb triangular, sides straight to faintly undulate, apices narrow and blunt, biconvex in equatorial view. Triporate, pores 5 to 8 μ in diameter. Exine 3 to 3·5 μ thick at the poles and interradially, nexine thicker than sexine; columellate layer thinner than tectum, columellae large and irregular, 0·5 to 1 μ in diameter, some elongate up to 2 μ long and 1 μ wide, others with less regular shapes. Tectum complete with evenly distributed, constant size perforations, 0·5 μ in diameter. Collars of thin exine, 14 to 18 μ wide, developed around apertures and distinguished by a marked thinning of the exine to less than 1 μ. Nexine thickness uncertain, layer obscure. Columellate layer and tectum thinner, and the columellae and perforations are smaller over the collars than in the polar areas. Dimensions, equatorial diameter 40 (51) 59 μ, 14 specimens measured.

COMPARISON: The marked differential thickening of the exine and the coarse columellate layer in the polar areas serve to distinguish *Proteacidites reflexus* from other species of *Proteacidites*.

HOLOTYPE: Specimen on slide P29856, 59 μ in diameter.

Type Locality and Strata: Rosedale-1 well at 2287 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

Stratigraphic Range: Lower *Nothofagidites asperus* Zone, middle and late Eocene.

Proteacidites reticulatus Cookson 1950
(Pl. 23, figs. 4, 5)

1950 *Proteacidites reticulatus* Cookson, p. 174, Pl. 1, fig. 24.

Description (Revised): Pollen isopolar, amb triangular, sides slightly to strongly concave, apices straight or nearly so. Exine 2·5 to 3 μ thick interradially, about 2 μ thick at the apertures, nexine and sexine of about equal thickness, columellae distinct, single or paired. Sexine reticulate, muri about 2 μ wide over most of the surface, about 1 μ wide at apertures; lumina irregularly polygonal, longest dimension 3 to 9 μ over most of the surface, more or less circular and 1 μ or less at apertures. Pores 3 to 4 μ wide, usually poorly delimited. Dimensions, 25 (37) 43 μ, 16 specimens measured.

Comparison: *Proteacidites reticulatus* is morphologically quite similar to *P. leightonii* Stover, from which it differs by being considerably smaller.

Neotype: Specimens on slide P29694, 36 μ in diameter. Because efforts to locate the specimen illustrated by Cookson (1950, Pl. 1, fig. 24) have been unsuccessful, a neotype is selected from one of Dr. Cookson's preparations of the Moorlands Brown Coal.

Type Locality and Strata: Moorlands Coalfield, South Australia, Moorlands lignite member of Renmark Beds, late Eocene, Lower *Nothofagidites asperus* Zone equivalent.

Stratigraphic Range: Within the *Malvacipollis diversus* Zone into the Lower *Nothofagidites asperus* Zone, early Eocene into late Eocene.

Proteacidites reticuloscabratus Harris 1965
(not illustrated)

1965 *Proteacidites reticuloscabratus* Harris, p. 93, Pl. 28, figs. 20, 21.

Stratigraphic Range: *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early Eocene into late Eocene.

Proteacidites stipplatus Partridge, n. sp.
(Pl. 24, figs. 2, 3)

Description: Pollen isopolar, amb triangular, sides straight or nearly so, apices truncated. Exine 3 to 4·5 μ thick, nexine 2 to 3·5 μ thick, sexine with closely spaced granulae or less commonly with circular to elongate tuberculae, 1 μ or less in diameter, 2 to 3 μ long, about 0·5 μ in height and of fairly constant size on individual specimens. Distances between granulae less than their diameters, may be more widely spaced particularly when granules are coalesced to form short, arcuate to sinuous ridges. Columellae usually distinct on specimens with fine sculpturing, less distinct or not discernible on those with coarse sculpturing. Pore margins concave in polar view, somewhat depressed, pores 6 to 11 μ wide. Dimensions, 39 (51) 68 μ in diameter, 20 specimens measured.

Comparison: *Proteacidites stipplatus* differs from *P. recavus* by having straight sides and granulate to tuberculate rather than reticulate sculpturing. The small size and density of the sculpturing serve to distinguish the new species from *P. tuberculatus*.

Holotype: Specimen on slide P29757, 48 μ in diameter.

Type Locality and Strata: Loy Yang-842 bore at 483-486 ft, *Proteacidites tuberculatus* Zone, early Oligocene.

Stratigraphic Range: Lower *Nothofagidites asperus* Zone into the *Proteacidites tuberculatus* Zone, late Eocene into Oligocene.

Proteacidites symphyonemoides Cookson 1950
(Pl. 25, figs. 1, 2)

1950 *Proteacidites symphyonemoides* Cookson, p. 172, Pl. 2, fig. 17.

Description (Revised): Pollen slightly anisopolar, amb triangular, sides straight to slightly concave, apices truncated. Exine 2 to 2·5 μ thick, nexine and sexine approximately equal in thickness, sexine reticulate. Muri 1 to 1·5 μ wide, convolute, lumina irregular, 1·5 to 3 μ in maximum length, mesh of reticulum fairly uniform over entire pollen, muri underlain by single and paired columellae. Pores 4 μ in diameter, outer margin straight in polar view. Dimensions, equatorial diameter 22 (26) 35 μ, 10 specimens measured.

Lectotype: Specimen on slide P29670, 34·5 μ in diameter, and illustrated by Cookson (1950, Pl. 1, fig. 17).

Type Locality and Strata: Yallourn Open Cut, Victoria, clay at base of Yallourn Coal seam, *Triporopollenites bellus* Zone, late Miocene.

Stratigraphic Range: *Triporopollenites bellus* Zone, late Miocene.

Remarks: Although small reticulate specimens of *Proteacidites* are common in Eocene assemblages, none appear conformable with *P. symphyonemoides* and there is a distinct stratigraphic discontinuity between the Eocene forms and the late Miocene occurrence of *P. symphyonemoides*. In the *Proteacidites tuberculatus* Zone, small reticulate species are absent or different morphologically from *P. symphyonemoides*. The specimens illustrated by Harris (1965) and by Couper (1960) identified as *P. symphyonemoides*, probably belong to another species.

Proteacidites tenuiexinus Stover, n. sp.
(Pl. 25, figs. 6, 7)

Description: Pollen isopolar to slightly anisopolar, amb convexly triangular. Exine stratification faint to distinct, exine slightly over 1 μ thick, nexine extremely thin, tends to be thicker around the apertures than between them. Sexine granulate to unevenly scabrate. Pore margins gently concave in polar view, 4 to 6 μ wide. Dimensions, 29 (33) 36 μ in diameter, 17 specimens measured.

COMPARISON: The convexly triangular outline, thin exine and scabrate to granulate sculpturing are characteristic of the species, which collectively serve to separate *Proteacidites tenuiexinus* from other *Proteacidites* species of similar size.

HOLOTYPE: Specimen on slide P28085, 35 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 3996 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

STRATIGRAPHIC RANGE: Upper part of *Lygistepollenites balmei* Zone into the Lower *Nothofagidites asperus* Zone, late Paleocene to middle Eocene.

Proteacidites tuberculatus Cookson 1950
(Pl. 24, fig. 1)

1950 *Proteacidites tuberculatus* Cookson, p. 170, Pl. 1, figs. 12-14.

LECTOTYPE: Specimen on slide P29674, 111 μ in diameter and illustrated by Cookson (1950, Pl. 1, fig. 13), here designated.

TYPE LOCALITY AND STRATA: Yallourn Open Cut, Victoria, Yallourn Coal Seam at 92 ft, below the top of the seam, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: Upper *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, late Eocene through late Miocene.

Proteacidites tuberculiformis Harris 1965
(not illustrated)

1965 *Proteacidites tuberculiformis* Harris, p. 92, Pl. 29, figs. 5-7.

STRATIGRAPHIC RANGE: Within the *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early Eocene into late Eocene.

Genus **Triorites** Cookson emended Potonié 1960
Triorites magnificus Cookson 1950
(Pl. 25, fig. 9)

1950 *Triorites magnificus* Cookson, pp. 175, 176, Pl. 3, figs. 32-35.
1960 ———— Cookson *ex* Couper, Potonié, p. 128, Pl. 8, fig. 175.
1973 ———— Cookson, Stover & Evans (in press).

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone, late Eocene.

Genus **Triporopollenites** Pflug & Thomson 1953
Triporopollenites ambiguus Stover, n. sp.
(Pl. 21, fig. 7)

DESCRIPTION: Pollen isopolar, amb triangular, sides straight or slightly convex. Exine undifferentiated, relatively thin (about 1 μ thick), thickened slightly around apertures, surface with widely scattered apiculae and with or without occasional granulae. Pores in polar view 5 to 7 μ wide, outline concave. Dimensions, 34 (40) 48 μ in diameter, 10 specimens measured.

COMPARISON: *Triporopollenites ambiguus* differs from *T. chnosus* Partridge (this paper) by having a thinner exine with apiculae.

HOLOTYPE: Specimen on slide P28049, 46 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 4308 ft, *Proteacidites asperopolus* Zone, early Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early Eocene into the late Eocene.

Triporopollenites bellus Partridge, n. sp.
(Pl. 27, figs. 9, 10)

DESCRIPTION: Pollen isopolar, spherical to oblate, amb circular. Majority of specimens triporate, others with 2, 4, or 5 equatorial pores, pores circular, 2 to 3 μ in diameter and annulate, annuli about 2 μ wide and up to 2·5 μ thick. Exine 2 μ thick equatorially, up to 3·5 μ thick at the poles, nexine and sexine of equal thickness at the equator, both layers thicker at the poles, the nexine less so than the sexine, latter reticulate. Columellae single or paired and underlie narrow muri, also occur in a row around, but not on, the annuli. Lumina irregularly polygonal, from less less than 2 μ in diameter. Dimensions, equatorial diameter 15 (20) 32 μ, polar diameter 20 (22) 24 μ for specimens having an equatorial diameter between 17 and 22 μ, 29 specimens measured.

COMPARISON: *Triporopollenites bellus* differs from other Australian species of the genus by having a circular equatorial outline, a reticulate sexine, annulate pores and from 2 to 5 pores.

HOLOTYPE: Specimen on slide P29831, 22 x 23 μ.

TYPE LOCALITY AND STRATA: Rosedale-1 well at 476-480 ft, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: *Triporopollenites bellus* Zone, late Miocene.

Triporopollenites chnosus Partridge, n. sp.
(Pl. 21, fig. 6)

DESCRIPTION: Pollen anisopolar, concavo-convex in equatorial view, amb triangular, sides convex. Pores in polar view 5 to 8 μ wide, outline concave, and may be covered by a thin membrane. Exine 2 to 2·5 μ thick, nexine thicker than sexine, latter less than 0·5 μ, surface scabrate to very finely punctate, columellae not discernible. Dimensions, equatorial diameter 36 (45) 54 μ, 12 specimens measured.

COMPARISON: Consult comparison for *Triporopollenites ambiguus*.

HOLOTYPE: Specimen on slide P29821, 46 μ in diameter.

TYPE LOCALITY AND STRATA: Glencoe-4 well at 280 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: Within the Lower *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, late Eocene through Miocene.

Triporopollenites sectilis Stover, n. sp.
(Pl. 21, fig. 5)

1973 *Triporopollenites* sp. A, Stover & Evans (in press).

DESCRIPTION: Pollen isopolar, amb concavely triangular, apices broadly rounded to truncate. Exine slightly less than 2 μ thick, vaguely to moderately well differentiated, nexine thicker than sexine, latter psilate to irregularly roughened, columellae not discernible. Pores lalongate, appear slit-like in polar view, 4 to 6 μ wide. Dimensions, equatorial diameter 27 (31) 35 μ, 14 specimens measured.

COMPARISON: *Triporopollenites sectilis* differs from *T. chnosus* by being smaller and by having a concavely triangular equatorial outline.

HOLOTYPE: Specimen on slide P28093, 31 μ in diameter.

TYPE LOCALITY AND STRATA: Barracouta-1 well at 8695 ft, Latrobe Group, *Tricolporites lilliei* Zone, Late Cretaceous.

STRATIGRAPHIC RANGE: *Tricolporites lilliei* and *Tricolpites longus* Zones, late Cretaceous to early Paleocene, possibly middle Paleocene.

Hexaporate Pollen

Genus **Anacolosidites** Cookson & Pike 1954
Anacolosidites acutullus Cookson & Pike 1954
(Pl. 27, fig. 1)

1954 *Anacolosidites acutullus* Cookson & Pike, p. 208, Pl. 1, figs. 62, 63.
1965 ——— Cookson & Pike, Harris, p. 94, Pl. 27, figs. 27, 28.

DESCRIPTION (Revised): Amb triangular, sides slightly convex, corners moderately rounded. Exine 1·5 to just over 3 μ, thinnest in the areas adjacent to the corners and thickest in the central marginal areas. Nexine 1 to 2 μ, thicker than sexine; outer surface of sexine appears psilate and continuous, columellate layer composed of discrete, more or less circular rodlets about 0·75 μ in diameter plus short, straight or curved elevations whose lengths are 2 to 4 times their widths, the latter being about 1 μ, columellate ridges largest in the polar areas, and those on one polar area slightly coarser than those on the opposite polar area. Apertures circular, 4 μ in diameter, located approximately 10 μ from the corners of the equatorial margin (some apertures are elliptical—5·5 x 3 μ, however the apparent elongation may be due to compression).

LECTOTYPE: Specimen on slide P29661, 41·5 x 43 μ in diameter and illustrated by Cookson & Pike (1954, Pl. 1, fig. 62).

TYPE LOCALITY AND STRATA: Birregurra-1 bore at 842-843 ft, Lower *Nothofagidites asperus* Zone equivalent, middle Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone to the basal part of the Lower *Nothofagidites asperus* Zone, early to middle Eocene.

REMARKS: The supplementary description is based primarily on the lectotype. We were unable to locate the other specimen of *Anacolosidites acutullus* illustrated by Cookson and Pike. Specimens from the Gippsland Basin are generally less well preserved and the elevations in the columellate layer are slightly smaller than those on the lectotype.

Anacolosidites luteoides Cookson & Pike 1954
(Pl. 27, fig. 6)

1954 *Anacolosidites luteoides* Cookson & Pike, p. 207, Pl. 1, fig. 50, not figs. 47-49.
1959 ——— Cookson & Pike, Krutzsch, p. 244, (selected as lectotype the specimen illustrated as fig. 50 of Pl. 1 in Cookson & Pike, 1954).
1965 ——— Cookson & Pike, Harris, p. 94, Pl. 27, fig. 29.
1968 ——— Cookson & Pike, McIntyre, p. 195, figs. 55, 56.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone into the Lower *Nothofagidites asperus* Zone, early and middle Eocene.

Anacolosidites sectus Partridge, n. sp.
(Pl. 27, figs. 7, 8)

1954 *Anacolosidites luteoides* Cookson & Pike, p. 207, Pl. 1, figs. 47-49.

DESCRIPTION: Amb triangular with convex, straight, or less commonly concave sides and moderately to narrowly rounded corners. Apertures paired, three on each polar surface, those on one surface directly overlie those on the opposite surface, apertural margins usually indistinct. Aperture in nexine slit-like, narrow, may extend to the poles and never cross the equator; apertures in sexine less distinct, margins towards the poles frequently arcuate owing to apparent sexinal thickening in the polar areas. Exine from slightly over 1 μ to 2 μ thick, sexine thinner than nexine, latter less than 0·5 μ to 1 μ thick. Columellae very small, usually not discernible except in interradial areas. Sexine finely perforate except in the darker, triangular to circular patch over the polar areas. Diameter 18 (21) 24 μ, 18 specimens measured.

COMPARISON: *Anacolosidites sectus* differs from other species of *Anacolosidites* by having slit-like apertures.

HOLOTYPE: Specimen on slide P29744, 18 μ in diameter.

TYPE LOCALITY AND STRATA: Alberton West-138 bore at 188 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone, late Eocene.

Stephanoporate Pollen

Genus **Australopollis** Krutzsch 1966
Australopollis obscurus (Harris) Krutzsch 1966
(not illustrated)

1965 *Stephanoporopollenites obscurus* Harris, p. 95, Pl. 29, figs. 15-17.

1966 *Australopollis obscurus* (Harris), Krutzsch, p. 38.
1973 ——— (Harris) Krutzsch, Stover & Evans (in press).

Description (Revised): Amb circular or nearly so; exine 2 to 2·5 μ thick, clearly differentiated into nexine and sexine with both layers about equally thick. Columellae singular, connected distally to form muri of small mesh reticulum; lumina generally wider than muri, polygonal to elongate. Apertures porate, equatorial to subequatorial, 5 to 7, more or less circular, 6 to 8 μ in diameter, margins ragged and pores on some specimens covered by sexinous membrane. Diameter 25 (34) 40 μ, 20 specimens measured.

Stratigraphic Range: *Tricolpites longus* and *Lygistepollenites balmei* Zones, Paleocene. In the Otway Basin *Australopollis obscurus* has a longer range inasmuch as Dettmann and Playford (1969) reported this species from the *Appendicisporites distocarinatus* Zone (Cenomanian) and younger Late Cretaceous zones and Harris (1965) listed it from the early Eocene Dilwyn Clay.

Remarks: Harris (1965) interpreted the sexine of *Australopollis obscurus* as scabrate to finely granular, whereas Krutzsch (1966) described it as punctate. By using oil immersion objectives and focusing on the outer surface of the pollen, a reticulate pattern is quite discernible. At a slightly lower focus level, that is, beneath the muri, the columellae appear as individual rodlets and impart to the pollen a granulate to scabrate appearance. On some specimens, the sculpturing is smaller on one hemisphere, and on such specimens the sexinal pattern could reasonably be interpreted as finely punctate or reticulo-punctate.

Genus **Haloragaeidites** Couper 1953
Haloragaeidites haloragoides Cookson & Pike 1954
(Pl. 27, figs. 4, 5)

1954 *Haloragacidites haloragoides* Cookson & Pike, p. 202, Pl. 1, figs. 7-9.

Stratigraphic Range: Upper part of *Triporopollenites bellus* Zone, late Miocene.

Haloragacidites harrisii (Couper) Harris 1971
(not illustrated)

1971 *Haloragacidites harrisii* (Couper) Harris in Mildenhall & Harris, pp. 304, 305, figs. 8-11. For synonymy prior to 1971 consult this reference.
1973 *Triorites harrisii* Stover & Evans (in press).

Stratigraphic Range: *Lygistepollenites balmei* Zone through *Triporopollenites bellus* Zone, middle Paleocene through Miocene.

Haloragacidites amolosus Partridge, n. sp.
(Pl. 27, figs. 2, 3)

Description: Pollen isopolar, oblate, amb subcircular, outline commonly distorted. Stephanoporate, usually with 4 or 5 pores, pores aspidate, lolongate, rupate. Exine averages 1·5 μ in thickness between apertures and on polar areas, up to 4 μ in thickness around pores. Areas of thickened exine dome-like and about 12 μ in diameter. Exine stratification indistinct, sexine appears to be slightly thicker than nexine, pollen intectate. Surface psilate to scabrate. Equatorial diameter, 28 (30) 35 μ, 13 specimens measured.

Comparison: *Haloragacidites amolosus* differs from *H. haloragoides* Cookson & Pike 1954 by having a thinner exine and more protrusive apertures.

Holotype: Specimen on slide P29817, 30 μ in diameter.

Type Locality and Strata: Wurruk-1 well at 202 ft, post-*Triporopollenites bellus* Zone, probably Pliocene.

Stratigraphic Range: Pliocene?

Genus **Helciporites** Partridge, n. gen.
Type Species: **Helciporites astrus** Partridge, n. sp. here designated.

Diagnosis: Pollen free, radially symmetrical, isopolar, stephanoporate, pore number variable from 4 to 8, pores with annulate thickening of the nexine, exine minutely granulate on type species. Monotypic, affinity unknown.

Comparison: *Helciporites* differs from other stephanoporate form-genera by having annuli developed in the nexine around the pores.

Helciporites astrus Partridge, n. sp.
(Pl. 26, figs. 3-5)

Description: Amb circular to polygonal, margin between apertures convex to concave, equatorial view biconvex; stephanoporate, pores generally aspidate, 4 to 8, commonly 5 or 6, 1·5 to 2·5 μ in diameter. Nexinal annuli 6 to 8 μ in diameter, 1·5 μ thick; exine 1 to nearly 2 μ thick, vaguely to clearly differentiated between apertures, sexine 0·5 to 1 μ thick, minutely granulate or possibly apiculate. Dimensions, 16 (20) 24 μ in diameter, 18 specimens measured.

Comparison: *Helciporites astrus* differs from *Haloragacidites haloragoides* Cookson & Pike 1954 by having circular rather than colpoid apertures, more distinct exine stratification and by having the nexine thickened adjacent to the pores to form the annuli.

Holotype: Specimen on slide P29728, 21 μ in diameter.

Type Locality and Strata: Willung-121 bore at 324-326 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

Stratigraphic Range: *Proteacidites asperopolus* Zone through the Lower *Nothofagidites asperus* Zone; early to late Eocene.

Genus **Malvacipollis** Harris 1965
Type Species: **Malvacipollis diversus** Harris 1965, monotypic when proposed.

Comments: The circumscription by Krutzsch (1966) modified the generic concept of *Malvacipollis* to include; (1) both panaperturate and stephanoaperturate pollen, (2) pollen with sexinal sculptural types in addition to those specified by Harris (1965—spinate, spinulate) and (3) specimens in which the distribution of sexinal sculpturing is localized or global. Among the Australian species, the sculptural features are uniformly distributed and consist of coni, spinules or spines; however, only one type of sculpturing occurs on individual specimens. Pan- and stephanoaperturate forms are found in Gippsland Basin assemblages and the latter arc by far the more abundant.

Malvacipollis diversus Harris 1965
(Pl. 26, fig. 6)

1965 *Malvacipollis diversus* Harris, p. 95, Pl. 29, fig. 18, not fig. 19.
1973 ———— Stover & Evans (in press).

Description (Rcvised): Pollen oblate, stephanoaperturate, amb circular. Exine stratification fairly distinct, sexine much thicker than nexine; columellae small, singular, evenly distributed, rather dense; ectosexine psilate, attenuated into conate projections whose bases are equal to or slightly wider than thcir heights. Apertures equatorial, porate, 5 to 8 (usually 6), circular to elliptical, nonaspidate. Dimensions, 23 (26) 31 μ in diameter exclusive of spines, 30 specimens measured out of more than 200.

Stratigraphic Range: Upper part of *Lygistepollenites balmei* Zone through the *Proteacidites asperopolus* Zone, late Paleocene through early Eocene. This species is usually common in the lower portion of the *Malvacipollis diversus* Zone.

Remarks: Harris (1965) illustratcd two specimcns of *Malvacipollis diversus*. The holotype (his Pl. 29, fig. 18) has low, broad-based conate projections, indications of a thin columellate layer and is relativcly small. The other specimens (his Pl. 29, fig. 19) has slender sharply-tipped, spinate projections and is larger than the holotype. Based on abundant specimens from the Latrobe Group, the specimens illustrated by Harris are interpreted as reprcsenting two species, *Malvacipollis diversus* (*s.s.*) and *Malvacipollis subtilis* Stover, n. sp.

Malvacipollis subtilis Stover, n. sp.
(Pl. 26, fig. 7-9)

1965 *Malvacipollis diversus* Harris, Pl. 29, fig. 19, not fig. 18.

Description: Pollen stephanoaperturate, oblate to subspherical, amb circular. Exine stratification distinct, nexine extremely thin, sexine 1 to 2·5 thick, columellatc laycr thinncr than extosexine; columellae singular, dense, uniformly distributed; ectosexine psilate, surface with spinules or spines, 2 to 4 μ long, length greater than basal diameter, tips pointed, sides tapered. Apertures equatorial on most grains, occasionally with scattered global pores as well; pores circular to elliptical, non-aspidate. Dimensions, 22 (30) 34 μ in diameter exclusive of spinules or spines, 25 specimens measured.

Comparison: *Malvacipollis subtilis* differs from *M. diversus* by having spines or spinules rather than conate projections, and the spines tend to be morc widely spaced, particularly on specimens in the upper half of the size range on which the aperturcs are more apparent. Although the size ranges of the two species overlap, specimens of *M. subtilis* are generally larger.

Holotype: Specimen on slide P28088, 29 μ in diameter exclusive of spines.

Type Locality and Strata: Marlin-1 well at 4891 ft, Latrobe Group, *Malvacipollis diversus* Zone, early Eocene.

Stratigraphic Range: Upper part of *Lygistepollenites balmei* Zone through the *Triporopollenites bellus* Zone, early Eocene through late Miocenc.

Periporate Pollen

Genus **Periporopollenites** Pflug & Thomson 1953

1953 *Periporopollenites* Pflug & Thomson in Thomson & Pflug, p. 111.
1960 *Liquidambarpollenites* Raatz, Potonié, p. 134.
1960 *Caryophyllidites* Couper, p. 68.
1966 *Periporopollenites* Thomson & Pflug emend. Krutzsch, p. 39

Type Species: **Periporopollenites stigmosus** Potonié, designated by Pflug & Thomson in Thomson & Pflug (1953, p. 111).

Remarks: *Periporopollenites* is used here for periporate pollen having 10 to approximately 32 apertures, clearly stratified and comparatively thin exines (relative to the overall size of the grains), and simple pores with or without spanning membranes. The exine is puncto-granulate to finely reticulate and lacks sculptural protrusions. This diagnosis excludes small, thick-walled, multiporate forms assignable to *Chenopodipollis* Krutzsch 1966 as well as several more coarsely sculptured forms such as *Malvacipollis* Harris 1965 and the buxaceous types.

In June 1968, Dr. P. R. Evans examined the holotype of *Caryophyllidites polyoratus* Couper 1960. Based on Evans' notes and comments (Stover, pers. comm.), on the examination of the holotype of *Polyporina fragilis* Harris 1965, and on the study of numcrous specimens from the Gippsland and Bass Basins provisionally identified as *P. fragilis*, the two species are considered conspecific and assignment of these forms to *Periporopollenites* as *P. polyoratus* (Couper) Stover, new combination is proposed here.

Periporopollenites polyoratus (Couper) Stover, n. comb.
(Not illustratcd)

1960 *Caryophyllidites polyoratus* Couper, p. 68, Pl. 10, fig. 14.
1965 *Polyporina fragilis* Harris, p. 95, Pl. 29, fig. 20, 21.
1966 *Chenopodipollis fragilis* (Harris) Krutzsch, p. 35.
1966 *Caryophyllidites polyoratus* Couper, Krutzsch, p. 40.

Stratigraphic Range: *Tricolporites lilliei* Zone through *Malvacipollis diversus* Zone, Late Cretaceous into the early Eocene.

Periporopollenites demarcatus Stover n. sp.
(Pl. 26, figs. 10, 11)

Description: Subspherical, amb circular to polygonal; exine clearly stratified, nexine about 0·5 μ thick, sexine 1 to 1·5 μ, columellae singular, dense, uniformly distributed, ectosexine scabrate to puncto-reticulate. Pores circular or nearly so, 6 to 8 μ in diameter and with or without membraneous covering, pore number 12, pore arrangement symmetrical with 6 subequatorial to equatorial pores and 3 pores in each hemisphere located about midway between equator and poles. Because of rotation, some specimens appear to have 3 sets of 4 pores each. Dimensions, 26 (29) 35 μ, 25 specimens measured.

COMPARISON: *Periporopollenites demarcatus* differs from *P. polyoratus* by having fewer and larger apertures and is generally smaller.

HOLOTYPE: Specimen on slide P28077, 32 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 3996 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: Within the *Malvacipollis diversus* Zone into the *Proteacidites tuberculatus* Zone, early Eocene into early Miocene.

Periporopollenites vesicus Partridge, n. sp.
(Pl. 26, fig. 12)

DESCRIPTION: Spherical, amb circular or nearly so, outline commonly modified by folding; exine stratification generally clear but columellae usually indistinct, exine 1·5 to 3 μ, sexine 1 to 2 μ, puncto-reticulate, thicker than nexine. Pores circular, 3 to 10 μ (average 5 μ) in diameter, generally with distended (domed) faintly granular membrane across pores; pore number 14 to 25, average 17. Dimensions, 23 (35) 50 μ in diameter, 9 specimens measured.

COMPARISON: *Periporopollenites vesicus* differs from *P. demarcatus* Stover (this paper) by having a larger number of pores, generally less distinct columellae, and by being more frequently than not, greater in diameter although the size ranges of the two species overlap.

HOLOTYPE: Specimen on slide P29893, 36 μ in diameter with 20 pores.

TYPE LOCALITY AND STRATA: Loy Yang-842 bore at 483-486 ft, *Proteacidites tuberculatus* Zone, early Oligocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone into the *Proteacidites tuberculatus* Zone, middle Eocene through Oligocene.

Pollen Retained in Tetrads

Genus **Bysmapollis** Partridge, n. gen.
Type Species: **Bysmapollis emaciatus** Partridge, n. sp., here designated.

DIAGNOSIS: Porate pollen retained exclusively in tetrahedral tetrads; pores located at the distal intersections of three individual pollen, latter triporate. Sculpturing variable, gemmate and granulate on type species. Monotypic, affinity unknown.

REMARKS: *Bysmapollis* is proposed for triporate pollen in tetrads with the pores arranged as on the type species. Because of this arrangement, the pores appear in four groups of three pores per group around the tetrad. This particular pore configuration has not been described for other tetrad genera.

Bysmapollis emaciatus Partirdge, n. sp.
(Pl. 28, fig. 1)

DESCRIPTION: Individual pollen in tetrahedral tetrads subspherical, amb circular, triporate; pores elliptical, 3 x 5 μ, situated at intersections of three individual pollen, pores generally obscure. Nexine 1 to 1·5 μ thick, sexine lacking on proximal surface, on distal surface consists of granulae 0·5 to 1·5 μ in diameter, of gemmae or rounded verrucae 2 to 8 μ in diameter, 2 to 4 μ in height, generally regularly spaced. Apertures usually surrounded by band of small verrucae 1·5 to 2 μ in diameter. Diameter of tetrad exclusive of sculpturing 34 (38) 45 μ; diameter of individual pollen 25 (29) 32 μ, 8 specimens measured.

HOLOTYPE: Specimen on slide P29744, 40 μ in diameter.

TYPE LOCALITY AND STRATA: Alberton West-138 bore at 188 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone through the Lower *Nothofagidites asperus* Zone, early to late Eocene.

Genus **Ericipites** Wodehouse 1933
Ericipites crassiexinus Harris 1972
(not illustrated)

1972 *Ericipites crassiexinus* Harris, pp. 54, 55, figs. 15, 16.
1973 Tetrahedral tetrad, Stover & Evans (in press).

STRATIGRAPHIC RANGE: *Malvacipollis diverus* Zone through the *Triporopollenites bellus* Zone, early Eocene through Miocene.

Genus **Gephyrapollenites** Stover, n. gen.
Type Species: **Gephyrapollenites cranwellae** Stover, n. sp., here designated.

DIAGNOSIS: Monoporate pollen, free or united in tetrads; exine stratified, sexine thicker than nexine, sexine reticulate, reduced or absent proximally; pore distal, circular to elliptical, annulate.

COMPARISON: The new genus differs from *Graminidites* Cookson 1947 by having a thicker exine and a reticulate sexine at least over part of the pollen; the latter feature also serves to separate *Gephyrapollenites* from *Aglaoreidia* Erdtman 1960 on which the reticulation is not confined to the distal surface.

REMARKS: *Gephyrapollenites* is proposed for the reception of fossil pollen, either singularly or in tetrads, that are morphologically similar to the pollen from the extant genus *Drimys*.

Gephyrapollenites cranwellae Stover, n. sp.
(Pl. 28, fig. 7)

DESCRIPTION: Pollen monaperturate, free or united in tetrads; equatorial outline circular or nearly so, pollen in tetrads oblate, anisopolar. Exine stratification distinct; nexine thinner than sexine over equatorial and most of distal areas, apparently thicker than sexine in proximal area; sexine clearly evident distally and equatorially on isolated pollen and on those in tetrads, greatly reduced or absent proximally. Columellate layer distinct, discontinuous; columellae support muri of wide-mesh reticulum, absent in lumen. Maximum thickness of exine about 4 μ; nexine approximately 1 μ thick; ectosexine thicker than endosexine. Distal polar pore circular to elliptical, 6-7 μ in diameter; nexine thickened to slightly over 2 μ around pore to form annulus; annulus about 2 μ wide. Sexine extends to pore margin or may be absent around the aperture leaving an unsculptured circular band 2 to 3 μ wide. Tetrads 43 (48) 51 μ in diameter; individual pollen 29 (31) 36 μ in diameter, 11 specimens measured.

COMPARISON: *Gephyrapollenites cranwellae* differs from other species of fossil monoporate genera by having a reticulate sexine that is strongly developed equatorially and distally.

HOLOTYPE: Specimen on slide P28077, tetrad 42 x 49 μ, individual pollen 31 to 33 μ in diameter.

TYPE LOCALITY AND STRATA: Bass-2 well at 3996 ft, Lower *Nothofagidites asperus* Zone, middle Eocene.

STRATIGRAPHIC RANGE: *Malvacipollis diversus* Zone, through *Nothofagidites asperus* Zone, early to late Eocene.

Gephyrapollenites calathus Partridge, n. sp.
(Pl. 28, fig. 3)

1960 (?) *Pseudowinteria* sp. in Couper, p. 46, Pl. 5, fig. 4.

DESCRIPTION: Pollen retained in tetrahedral tetrads, individual pollen oblate, amb circular or nearly so, monoporate. Pore circular, distal, 7 to 14 μ in diameter. Exine 2 to 4 μ thick distally, less than 1 μ thick proximally where the sexine is absent; sexine on distal surface only, 1 to 3·5 μ thick, reticulate. Muri about 1 μ wide, underlain by single columellae, lumina regular to labyrinthine, up to 4 μ in diameter. Dimensions, diameter of tetrad 21 (28) 38 μ, equatorial diameter of individual pollen 15 to 30 μ, 10 specimens measured.

COMPARISON: *Gephyrapollenites calathus* differs from *G. cranwellae* Stover (this paper) by being smaller and by having non-annulate pores.

HOLOTYPE: Tetrad on slide P29832, 28 μ in diameter, equatorial diameter of individual pollen 22 μ, polar diameter 13 μ.

TYPE LOCALITY AND STRATA: Wurruk-1 well at 529 ft, *Triporopollenites bellus* Zone, late Miocene.

STRATIGRAPHIC RANGE: Lower *Nothofagidites asperus* Zone through the *Triporopollenites bellus* Zone, late Eocene through Miocene.

Gephyrapollenites wahooensis Stover, n. sp.
(Pl. 28, figs. 4-6)

DESCRIPTION: Pollen retained in obligate tetrads, individual pollen pyramidal, distal surface convex generally with slight central depression, amb roundly triangular. Exine from about 1 μ to 3 μ thick, nexine 0·5 to 1 μ thick, sexine 1·5 to 2 μ thick, reticulate distally and equatorially, sexine absent or very thin and non-reticulate proximally. Muri or reticulum about 1 μ wide or less, lumina irregular, tend to be elongate and arranged somewhat radially around the aperture, obscure and poorly defined. Dimensions, diameter of tetrad 26 (28) 31 μ, equatorial diameter of individual pollen 19 (22) 24 μ, polar diameter 13 to 14 μ, 8 specimens measured.

COMPARISON: *Gephyrapollenites wahooensis* differs from *G. calathus* Partridge (this paper) by having a less distinct pore. There is also a marked disparity in the stratigraphic ranges of the two species.

HOLOTYPE: Specimen on slide P28101, 28 μ in diameter.

TYPE LOCALITY AND STRATA: Wahoo-1 well at 1844 ft, Latrobe Group, *Tricolpites longus* Zone, early, possibly middle Paleocene.

STRATIGRAPHIC RANGE: *Tricolporites lilliei* Zone into the *Lygistepollenites balmei* Zone, Late Cretaceous to late Paleocene.

Genus **Paripollis** Partridge, n. gen.
Type species: **Paripollis ochesis** Partridge, n. sp., here designated.

DIAGNOSIS: Pollen retained in tetrahedral tetrads, individual pollen tricolporate, apertures directly opposite each other along and at the centre of the line of contact between adjacent pollen. Sculpturing variable, verrucate on type species. Monotypic.

COMPARISON: The presence of tricolporate apertures serves to differentiate this genus from *Bysmapollis* Partridge (this paper) and from *Simplicepollis* Harris 1965 which have porate apertures, and from *Ericipites* Wodehouse 1933 which, if tricolporate rather than tricolpate, the ora are barely discernible. *Paripollis* may prove to be synonymous to *Dicotetradites* Couper 1953. However, the precise morphology of the apertures on the latter is uncertain.

Paripollis ochesis Partridge, n. sp.
(Pl. 28, fig. 2)

DESCRIPTION: Pollen retained in tetrahedral tetrads, individual pollen oblate, amb subcircular to subtriangular. Fossaperturate, colporate, ora distinct, colpi faint. Nexine 1 to 2 μ thick, sexine composed of circular to subangular verrucae with granulae between verrucae, latter 2 to 9 μ in diameter, average 2 to 3μ, 2·5 to 4 μ high and closely or widely spaced. Dimensions, tetrad diameter 33 (38) 47 μ, individual pollen 23 (27) 33 μ in equatorial diameter, 8 specimens measured.

COMPARISON: The position of the apertures plus the fact that the apertures are colporate rather than porate differentiate *Paripollis ochesis* from the superficially similar *Bysmapollis emaciatus* Partridge (this paper).

HOLOTYPE: Tetrad on slide P29771, 47 μ in diameter, individual pollen 33 μ in equatorial diameter.

Type Locality and Strata: Glencoe-4 well at 340 ft, Lower *Nothofagidites asperus* Zone, late Eocene.

Stratigraphic Range: Within the Lower *Nothofagidites asperus* Zone into the *Proteacidites tuberculatus* Zone, late Eocene and early Oligocene.

Genus **Simplicepollis** Harris 1965
Simplicepollis meridianus Harris 1965
(not illustrated)

1965 *Simplicepollis meridianus* Harris, p. 95, Pl. 27, figs. 32, 33.

Description (Revised): Pollen united in tetrahedral tetrads; distal surface of individual pollen hemispherical, proximal surface pyramidal. Exine stratification distinct, nexine about 0·5 μ thick, sexine about 1 μ thick, composed of dense, evenly distributed, minute columellae. In areas where adjacent pollen are in contact, the columellae form an imperfect intervening layer. Pollen triporate, pores broadly elliptical, about 6 x 4 μ; aperture commonly spanned by thin membrane with scattered granulae. Equatorial diameter of individual pollen 17 to 33 μ, of tetrads 31 to 42 μ.

Stratigraphic Range: Within the *Tricolporites lilliei* Zone through the Lower *Nothofagidites asperus* Zone, Late Cretaceous into late Eocene.

Remarks: Occasional specimens with 4 or 5 pores per individual pollen have been observed in assemblages from the Lower *Nothofagidites asperus* Zone. On such specimens, the pores are on the distal surface only and slightly off the equator. In general, specimens at the smaller end of the size range are found in assemblages from the older zones, whereas those at the larger end occur most frequently in the younger zones.

Genus **Quadraplanus** Stover, n. gen.
Type Species: **Quadraplanus brossus** Stover, n. sp., here designated.

Diagnosis: Pollen united in obligate planar (square) tetrads; individual pollen without radial symmetry and with an equatorial plane of symmetry. Apertures usually indistinct, individual pollen tetraporate, pores arranged in pairs on opposite polar surfaces (as in *Anacolosidites*) pairs at distal, subequatorial areas adjacent to the junctions of the individual pollen. Sexinal sculpturing variable, baculate to clavate on the type species. Monotypic.

Remarks: This form genus is proposed for pollen retained in obligate planar (square) tetrads. No other form genus has been proposed for tetrads with this configuration.

Quadraplanus brossus Stover, n. sp.
(Pl. 27, figs. 12-15)

Description: Pollen united in obligate planar (square) tetrads, circular in polar view, oblate to subspherical with flattened polar surfaces in equatorial view. Individual pollen occasionally fail to meet at the centre of the tetrad. Pollen within the tetrad isopolar, somewhat subtriangular in polar view, tetraporate; pores in nexine only, paired (as in *Anacolosidites*), two pairs per individual pollen. Pores occur near the distal corners of the pollen adjacent to the junctions of the individual pollen. Exine at the equator of the tetrad 4 to 6 μ thick, including sculpturing, nexine 1 to 2 μ thick, thickest around the pores and over the distal surfaces, thinner elsewhere. Sexine baculate and clavate, larger features tend to be clavae. A layer, less than 1 μ thick at the base of the sexine appears to bind the bases of the baculae or clavae. Baculae and clavae not connected distally and extend across the pores.

The sculptural features average 1 to 2 μ in diameter over most of the individual pollen, may be up to 5 microns in diameter and 3 μ in height, largest tend to occur along the junctions of individual pollen and the smallest in the polar areas. Dimensions, equatorial diameter 36 (46) 60 μ, 12 specimens measured.

Holotype: Specimen on slide P28101, 40 μ in diameter.

Type Locality and Strata: Wahoo-1 well at 1844 ft, *Tricolpites longus* Zone, early Paleocene, possibly middle Paleocene.

Stratigraphic Range: Within *Tricolporites lilliei* Zone through the *Tricolpites longus* Zone, Late Cretaceous to early Paleocene, possibly middle Paleocene.

Genus **Polyadopollenites** Pflug 1953
Polyadopollenites myriosporites (Cookson) Partridge, n. comb.
(Pl. 27, fig. 11)

1954 *Acacia myriosporites* Cookson, p. 55, Pl. 1, figs. 1, 5-8.

Description (Revised): Radially symmetrical polyad of 16 pollen, peroblate, circular to broadly elliptical in outline. Outline of individual pollen polar area square (13 to 15 μ), in equatorial area rectangular (8 x 12 μ to 10 x 16 μ), distal surface of individual pollen with faint, polygonal colpi. Exine less than 1 μ, psilate, nexine thicker than sexine, irregular patches of suprategillar granulae, 0·5 μ in diameter, on some polyads. Dimensions, 30 to 44 μ x 40 to 47 μ, 5 specimens measured.

Lectotype: Specimen on slide P29898. 52 x 52 μ, and illustrated by Cookson (1954, Pl. 1, fig. 1).

Type Locality and Strata: North bank of Grange Burn near Hamilton, Victoria; carbonaceous clay below diatomite, ? late Pliocene.

Stratigraphic Range: Within *Proteacidites tuberculatus* Zone through the *Triporopollenites bellus* Zone, Miocene.

Inaperturate Pollen

Genus **Dilwynites** Harris 1965
Dilwynites granulatus Harris 1965
(not illustrated)

1965 *Dilwynites granulatus* Harris, p. 88, Pl. 27, figs. 6, 7.

Stratigraphic Range: Within the *Tricolpites longus* Zone through the *Triporopollenites bellus* Zone, Paleocene through Miocene.

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APPENDIX 1

REGISTER OF LOCALITIES

1. Alberton West-138, Lat. 38° 38′S, Long. 146° 33′E, sample from 188 ft.
2. Barracouta-1, Lat. 38° 16′ 41″S, Long. 147° 42′ 45″E, samples from (a) 7251 ft and (b) 8695 ft.
3. Bass-1, Lat. 39° 46′ 18″S, Long. 145° 44′ 03″E, sample from 5400 ft.
4. Bass-2, Lat. 39° 53′ 09″S, Long. 146° 18′ 18″E, samples from (a) 3822 ft, (b) 3996 ft, (c) 4308 ft, (d) 4573 ft, (e) 4648 ft, (f) 4937 ft and (g) 5508 ft.
5. Colquhoun-12, Lat. 37° 23′S, Long. 147° 59′E, sample from 1352-1363 ft.
6. Coolungoolun-1, Lat. 38° 13′S, Long. 147° 04′E, sample from 290 ft.
7. Glencoe-4, Lat. 38° 11′S, Long. 147° 05′E, samples from (a) 280 ft, and (b) 340 ft.
8. Lakes Entrance Oil Shaft, Parish of Colquhoun, Allotment 31, East Gippsland, samples from (a) 352 ft, (b) 416 ft, (c) 492 ft and (d) 1188 ft.
9. Loy Yang-842, Lat. 38° 15′S, Long. 146° 37′E, samples from (a) 290-295 ft and (b) 483-486 ft.
10. Marlin-1, Lat. 38° 14′ 03″S, Long. 148° 15′ 33″E, sample from 4891 ft.
11. Marlin-2, Lat. 38° 15′ 59″S, Long. 148° 10′ 45″E, samples from (a) 7402 ft and (b) 8121 ft.

12. Marlin-3, Lat. 38° 14′ 44″S, Long. 148° 10′ 16″E, samples from (a) 5070 ft, (b) 5088 ft and (c) 5127 ft.
13. Maryvale-155, Lat. 38° 15′S, Long. 146° 24′E, sample from 552 ft.
14. Moolamoona Coal Mine, co-ordinates from Mirboo North Geologic Map; E 412.290, N 275.839, samples from (a) coal directly below basalt and (b) clay above coal further south.
15. Morwell Open Cut, Morwell, Victoria, sample from clay split between Morwell 1A and 1B seams, north wall approximately 200 ft above base of Morwell 1B seam.
16. Rosedale-1, Lat. 38° 08′S, Long. 146° 47′E, samples from (a) 476-480 ft, (b) 876-878 ft, (c) 1854-1857 ft, (d) 2098-2100 ft and (e) 2287-2289 ft.
17. Snapper-2, Lat. 38° 11′ 16″S, Long. 148° 02′ 37″E, sample from 8194 ft.
18. Tuna-1, Lat. 38° 10′ 25″S, Long. 148° 25′ 03″E, samples from (a) 4315-4317 ft and (b) 5927 ft.
19. Wahoo-1, Lat. 38° 01′ 42″S, Long. 148° 44′ 48″E, samples from (a) 1844 ft and (b) 1890 ft.
20. Willung-121, Lat. 38° 18′S, Long. 146° 44′E, samples from (a) 246-248 ft, and (b) 324-326 ft.
21. Wurruk-1, Lat. 38° 05′S, Long. 147° 02′E, samples from (a) 202 ft, (b) 426 ft, (c) 529 ft, (d) 716 ft, (e) 2698 ft, (f) 2898 ft and (g) 3023 ft.
22. Yallourn Open Cut, Yallourn, Victoria, samples from (a) clay at floor of cut below Yallourn seam, and (b) Yallourn seam approximately 80 ft above floor at north end.
23. Yallourn North Extension Open Cut, sample from Latrobe seam at base of lowest batter.

Appendix 2

REGISTER OF ILLUSTRATED SPECIMENS

Slide	Locality	Species	Type	Pl.	Fig.	Co-ordinates
P 28048	11 (a)	*Proteacidites angulatus*	paratype	22	5	R 02·0 + 12·5
P 28049	4 (c)	*Banksieaeidites arcuatus*	holotype	21	2	L 01·6 + 13·7
		Dryptopollenites semilunatus	holotype	17	1	R 06·3 + 15·0
		D. semilunatus	paratype	17	2	R 04·8 + 17·3
		Proteacidites asperopolus	topotype	26	2	L 16·5 + 08·2
		P. beddoesii	holotype	22	3	R 02·8 + 13·0
		P. beddoesii	paratype	22	4	R 03·6 + 02·3
		P. leightonii	holotype	23	1	L 03·6 + 08·0
		P. leightonii	paratype	23	2	R 06·1 + 02·8
		Tricolpites incisus	holotype	17	4	R 02·8 + 13·0
		T. incisus	paratype	17	5	R 03·8 + 19·0
		Triporopollenites ambiguus	holotype	21	7	L 02·0 + 12·3
P 28050	4 (e)	*Baculatisporites disconformis*	holotype	13	8	R 04·0 + 01·8
		Liliacidites lanceolatus	holotype	16	9	R 08·6 + 05·0
		L. lanceolatus	paratype	16	10	R 04·4 + 09·3
		Malvacipollis diversus	hypotype	26	6	R 09·0 − 01·1
		M. subtilis	paratype	26	8	L 17·8 + 05·4
		Proteacidites adenanthoides	hypotype	22	8	L 09·9 + 12·1
		Rugulatisporites mallatus	holotype	15	1	R 07·1 + 05·5
		Tricolporites paenestriatus	holotype	19	1	L 21·6 + 11·1
P 28055	4 (f)	*Polycolpites langstonii*	holotype	20	12	R 08·6 + 12·3
P 28057	3	*Ischyosporites gremius*	holotype	14	8	L 05·7 + 09·0
P 28063	4 (g)	*Gambierina rudata*	holotype	21	8	L 11·2 + 06·5
P 28065	12 (a)	*Bombacacidites bombaxoides*	hypotype	19	3	R 09·7 + 15·8
		Malvacipollis subtilis	paratype	26	7	R 05·8 + 00·4
P 28066	4 (b)	*Gothanipollis bassensis*	holotype	17	13	L 20·4 + 15·5
		Liliacidites bainii	paratype	16	7	R 00·2 + 06·5
		Polycolpites esobalteus	hypotype	20	11	R 03·3 + 10·5
		Tricolpites phillipsii	holotype	17	6	R 02·4 + 01·1
		T. phillipsii	paratype	17	7	L 07·2 + 14·3
P 28071	4 (a)	*Proteacidites obscurus*	hypotype	25	4	L 08·0 + 04·9
P 28074	12 (c)	*Banksieaeidites arcuatus*	paratype	21	3	L 04·1 + 00·2
		Polycolpites esobalteus	hypotype	20	10	R 05·0 + 16·7
		Proteacidites pseudomoides	holotype	25	3	L 01·4 + 05·0
P 28076	12 (b)	*P. alveolatus*	holotype	22	1	L 16·4 + 05·5

Slide	Locality	Species	Type	Pl.	Fig.	Co-ordinates
		P. alveolatus	paratype	22	2	L 09·3 + 04·2
P 28077	4 (b)	*Gephyrapollenites cranwellae*	holotype	28	7	R 06·2 + 11·6
		Periporopollenites demarcatus	holotype	26	11	L 08·0 + 01·0
P 28078	10	*Proteacidites tenuiexinus*	paratype	25	6	L 06·3 + 06·0
P 28079	10	*Schizocolpus marlinensis*	holotype	18	3	L 01·6 + 11·7
P 28082	11 (b)	*Tetracolporites verrucosus*	holotype	20	2	L 08·0 + 03·3
P 28085	4 (b)	*Proteacidites tenuiexinus*	holotype	25	7	L 20·5 + 17·6
P 28088	10	*Malvacipollis subtilis*	holotype	26	9	R 00·6 + 10·5
P 28090	4 (d)	*Schizocolpus marlinensis*	paratype	18	4	R 10·3 + 13·7
P 28091	2 (a)	*Proteacidites angulatus*	holotype	22	6	L 15·0 + 10·2
P 28093	2 (b)	*Triporopollenites sectilis*	holotype	21	5	L 01·3 + 12·2
P 28095	4 (b)	*Liliacidites bainii*	holotype	16	8	L 06·3 + 02·1
P 28097	18 (b)	*Tricolpites confessus*	holotype	17	3	L 02·8 + 11·4
P 28101	19 (a)	*Gephyrapollenites wahooensis*	holotype	28	4	L 20·1 + 02·1
		Quadraplanus brossus	holotype	27	13	L 22·0 + 08·2
		Q. brossus	paratype	27	14	L 20·5 + 08·1
P 28102	19 (a)	*Gephyrapollenites wahooensis*	paratype	28	6	R 05·2 + 09·4
P 28103	19 (b)	*G. wahooensis*	paratype	28	5	L 03·3 + 00·1
P 28118	17	*Tetracolporites verrucosus*	paratype	20	1	L 05·2 + 06·0
P 29712	15	*Proteacidites tuberculatus*	hypotype	24	1	R 05·5 + 05·0
P 29713	15	*Cyathidites subtilis*	paratype	13	2	R 12·2 + 06·5
P 29714	8 (a)	*C. subtilis*	holotype	13	1	R 02·5 + 14·2
P 29717	14 (b)	*Tricolporites retequetrus*	paratype	19	9	R 07·3 + 05·3
P 29720	15	*Matonisporites ornamentalis*	hypotype	13	3	L 07·4 + 11·5
		Proteacidites rectomarginis	hypotype	23	6	L 08·0 + 03·2
		Psilastephanocolporites micus	paratype	20	5	L 14·1 + 12·8
P 29721	14 (a)	*Tricolporites leuros*	holotype	19	7	R 19·1 + 19·6
P 29723	15	*Foveotriletes crater*	holotype	14	2	R 07·3 + 16·6
P 29724	15	*Cyatheacidites annulatus*	hypotype	13	6	R 17·0 + 14·0
		Proteacidites rectomarginis	hypotype	23	7	R 15·8 + 01·2
P 29725	15	*Cyatheacidites annulatus*	hypotype	13	5	R 06·8 + 08·2
		Proteacidites rectomarginis	hypotype	23	8	L 04·8 + 17·2
P 29728	20 (b)	*Anisotricolporites triplaxis*	holotype	18	8	L 07·9 + 13·2
		Helciporites astrus	holotype	26	3	L 05·6 + 10·5
		Tricolporites scabratus	hypotype	19	2	R 09·0 + 12·3
P 29732	9 (b)	*Granodiporites nebulosus*	holotype	21	1	R 03·4 + 14·5
P 29734	8 (d)	*Foveotriletes palaequetrus*	holotype	14	4	R 01·5 + 09·3
P 29738	14 (b)	*Tricolporites leuros*	paratype	19	6	R 04·2 + 14·2
P 29739	21 (f)	*Verrucosisporites kopukuensis*	hypotype	16	2	R 02·7 + 07·6
P 29743	22 (a)	*Myrtaceidites verrucosus*	holotype	17	17	L 22·3 + 11·6
		Proteacidites symphyonemoides	hypotype	25	2	R 05·4 + 00·6
P 29744	1	*Anacolosidites sectus*	holotype	27	7	L 15·3 + 12·8
		A. sectus	paratype	27	8	L 19·2 + 01·1
		Bysmapollis emaciatus	holotype	28	1	L 17·9 + 20·5
P 29746	20 (a)	*Parvisaccites catastus*	holotype	16	5	R 09·4 + 00·3
		P. catastus	paratype	16	6	R 08·5 + 03·5
		Periporopollenites demarcatus	paratype	26	10	R 02·9 + 19·6
		Proteacidites recavus	paratype	24	4	L 01·7 + 18·4
P 29747	21 (f)	*P. reticulatus*	hypotype	23	5	R 02·2 + 12·1
P 29750	15	*Matonisporites ornamentalis*	hypotype	13	4	L 08·7 + 08·6
P 29755	20 (b)	*Tricolpites simatus*	holotype	17	8	R 09·2 + 08·7
P 29756	1	*Banksieaeidites arcuatus*	paratype	21	4	L 16·2 + 19·2
		Concolpites leptos	holotype	18	1	L 14·5 + 19·2
		Gothanipollis bassensis	paratype	17	16	L 03·7 + 14·2
P 29757	9 (b)	*Proteacidites stipplatus*	holotype	24	3	R 02·7 + 09·6
P 29758	20 (b)	*Helciporites astrus*	paratype	26	5	R 03·6 + 10·1

Slide	Locality	Species	Type	Pl.	Fig.	Co-ordinates
P 29761	14 (b)	*Aglaoreidia qualumis*	paratype	20	9	R 02·0 + 16·7
P 29770	21 (f)	*Tricolporites retequetrus*	holotype	19	8	L 08·6 + 08·8
P 29771	7 (b)	*Paripollis ochesis*	holotype	28	2	L 17·0 + 13·3
		Proteacidites latrobensis	hypotype	25	5	L 22·2 + 07·0
P 29774	21 (e)	*Proteacidites stipplatus*	paratype	24	2	R 02·4 + 09·8
P 29777	21 (b)	*Foveotriletes crater*	paratype	14	3	R 03·4 + 14·0
P 29780	21 (b)	*Polypodiaceoisporites tumulatus*	holotype	16	4	R 02·6 + 06·9
P 29781	21 (b)	*Triporopollenites bellus*	paratype	27	10	R 08·0 + 12·7
P 29784	7 (a)	*Triorites magnificus*	hypotype	25	9	R 01·1 + 15·0
P 29792	21 (f)	*Verrucosisporites kopukuensis*	hypotype	16	3	R 02·5 + 11·8
P 29794	21 (f)	*Rugulatisporites trophus*	holotype	15	4	R 07·6 + 07·3
P 29795	7 (a)	*Peromonolites vellosus*	holotype	16	1	R 01·1 + 07·4
P 29796	21 (b)	*Rugulatisporites micraulaxus*	holotype	15	3	L 09·0 + 02·2
P 29797	21 (b)	*Haloragacidites haloragoides*	hypotype	27	4	R 02·0 + 17·7
		Sapotaceoidaepollenites rotundus	hypotype	20	13	R 02·6 + 15·4
P 29798	21 (b)	*Symplocoipollenites austellus*	holotype	17	20	L 06·2 + 09·6
P 29801	15	*Foveotriletes crater*	paratype	14	1	L 05·2 + 11·3
P 29803	20 (b)	*Anacolosidites luteoides*	hypotype	27	6	L 02·8 + 09·3
		Gothanipollis bassensis	paratype	17	14	L 13·8 + 02·9
		G. bassensis	paratype	17	15	L 01·2 + 06·7
		Tricolpites simatus	paratype	17	10	R 02·0 + 05·7
P 29804	8 (d)	*Verrucosisporites cristatus*	holotype	15	5	L 01·4 + 09·3
P 29805	16 (b)	*Polycolpites reticulatus*	hypotype	20	7	L 15·5 + 09·5
P 29807	8 (b)	*Tubulifloridites antipodica*	hypotype	18	12	R 02·4 + 01·5
P 29808	21 (d)	*T. antipodica*	hypotype	18	11	L 07·9 + 12·1
P 29814	21 (b)	*Haloragacidites haloragoides*	hypotype	27	5	L 08·1 + 10·2
		Polyadopollenites myriosporites	hypotype	27	11	L 09·8 + 14·9
P 29816	21 (b)	*Milfordia homeopunctata*	hypotype	21	10	R 04·6 + 06·6
P 29817	21 (a)	*Haloragacidites amolosus*	holotype	27	2	L 03·2 + 10·4
		H. amolosus	paratype	27	3	L 08·2 + 10·3
		Rugulatisporites micraulaxus	paratype	15	2	R 04·5 + 05·2
P 29821	7 (a)	*Triporopollenites chnosus*	holotype	21	6	R 02·8 + 09·8
P 29825	7 (a)	*Milfordia homeopunctata*	hypotype	21	11	R 15·5 + 03·8
P 29827	16 (d)	*Aglaoreidia qualumis*	holotype	20	8	R 01·4 + 13·3
P 29828	16 (c)	*Foveotriletes balteus*	holotype	14	7	R 06·5 + 15·3
P 29831	16 (a)	*Triporopollenites bellus*	holotype	27	9	L 07·4 + 09·0
P 29832	21 (c)	*Gephyrapollenites calathus*	holotype	28	3	L 04·0 + 17·8
P 29834	20 (b)	*Helciporites astrus*	paratype	26	4	L 05·6 + 10·5
P 29840	20 (b)	*Anisotricolporites triplaxis*	paratype	18	9	L 12·6 + 01·9
P 29844	9 (b)	*Peromonolites vellosus*	paratype	15	6	L 12·1 + 08·4
P 29845	21 (g)	*Tricolporites angurium*	holotype	18	10	L 12·6 + 04·7
P 29847	8 (c)	*Foveotriletes lacunosus*	holotype	14	6	R 06·7 + 04·6
P 29848	5	*F. palaequetrus*	paratype	14	5	L 01·9 + 18·6
P 29849	22 (b)	*Psilastephanocolporites micus*	paratype	20	6	R 00·4 + 10·9
P 29850	22 (b)	*P. micus*	paratype	20	4	R 05·9 + 05·0
P 29851	22 (b)	*P. micus*	holotype	20	3	R 07·4 + 08·9
P 29852	23	*Tricolporites leuros*	paratype	19	5	L 01·1 + 12·5
P 29855	16 (e)	*Gemmatricolporites gestus*	holotype	19	4	R 06·1 + 14·1
P 29856	16 (e)	*Proteacidites reflexus*	holotype	24	6	L 05·0 + 03·9
P 29858	9 (b)	*Herkosporites elliottii*	holotype	13	7	L 01·5 + 04·3
P 29860	6	*Proteacidites recavus*	holotype	24	5	R 01·0 + 08·8
P 29866	9 (a)	*Myrtaceidites verrucosus*	paratype	17	18	L 22·3 + 15·7
P 29874	13	*Tricolporites sphaerica*	topotype	18	6	R 03·5 + 11·7
P 29875	13	*T. sphaerica*	neotype	18	5	R 03·0 + 06·7
P 29876	13	*T. sphaerica*	topotype	18	7	L 00·9 + 12·3
P 29885	20 (b)	*Tricolpites simatus*	paratype	17	9	R 11·4 + 19·5

Slide	Locality	Species	Type	Pl.	Fig.	Co-ordinates
P 29888	14 (a)	*Myrtaceidites verrucosus*	paratype	17	19	L 08·8 + 00·8
P 29889	20 (b)	*Tricolpites simatus*	paratype	17	11	L 03·3 + 11·5
P 29893	9 (b)	*Periporopollenites vesicus*	holotype	26	12	L 00·9 + 04·1
P 29900	18 (a)	*Concolpites leptos*	paratype	18	2	L 07·9 + 03·3
P 29901	19 (a)	*Quadraplanus brossus*	paratype	27	12	R 04·2 − 01·0
		Q. brossus	paratype	27	15	R 02·7 + 10·2
Slides from Dr I. C. Cookson's Collection						
P 29660		*Tricolpites thomasii*	lectotype	17	12	R 07·2 + 13·5
P 29661		*Anacolosidites acutullus*	lectotype	27	1	L 01·6 + 10·5
P 29664		*Gambierina edwardsii*	lectotype	21	9	L 05·8 + 11·1
P 29669		*Proteacidites adenanthoides*	lectotype	22	7	R 24·2 + 5·0
		P. grandis	lectotype	23	3	L 01·6 + 15·2
P 29670		*P. symphyonemoides*	lectotype	25	1	L 05·4 + 05·2
P 29678		*P. pachypolus*	lectotype	26	1	L 02·6 + 16·4
P 29693		*P. incurvatus*	lectotype	25	8	R 19·8 + 12·0
P 29695		*P. crassus*	lectotype	22	9	R 25·4 + 03·9
		P. reticulatus	neotype	23	4	R 30·2 + 17·8

Index

EXPLANATION OF PLATES

Specimens photographed in normal transmitted light and enlarged to 800 magnification unless stated otherwise.

Plate 13

Fig. 1, 2—*Cyathidites subtilis* n. sp. Figs. 1a, 1b, proximal and distal surfaces of holotype Fig. 2, paratype at intermediate focus level.

Fig. 3, 4—*Matonisporites ornamentalis* (Cookson) n. comb. Fig. 3, proximal surface of hypotype, × 750. Figs. 4a, 4b, proximal and distal surfaces of another hypotype.

Fig. 5, 6—*Cyatheacidites annulatus* Cookson. Figs. 5a-5c, proximal, equatorial and distal focus levels of hypotype, × 500. Fig. 6, lateral view of another hypotype.

Fig. 7—*Herkosporites elliottii* n. gen., n. sp. Figs. 7a-7c, proximal, equatorial and distal focus levels of hypotype in interference contrast.

Fig. 8—*Baculatisporites disconformis* n. sp. Figs. 8a, 8b, proximal and distal surfaces of holotype.

Plate 14

Fig. 1-3—*Foveotriletes crater* n. sp. Figs. 1a-1c, proximal, equatorial and distal focus levels of paratype. Figs. 2a-2c, same as above for holotype. Figs. 3a-3c, same as above for another paratype.

Fig. 4, 5—*Foveotriletes palaequetrus* n. sp. Figs. 4a, 4b, proximal and distal surfaces of holotype. Fig. 5, proximal surface of paratype.

Fig. 6—*Foveotriletes lacunosus* n. sp. Figs. 6a-6c, proximal, equatorial and distal focus levels of holotype, × 750.

Fig. 7—*Foveotriletes balteus* n. sp. Figs. 7a, 7b, proximal and distal surfaces of holotype × 750.

Fig. 8—*Ischyosporites gremius* n. sp. Figs. 8a, 8b, proximal and distal surfaces of holotype.

Plate 15

Fig. 1—*Rugulatisporites mallatus* n. sp. Figs. 1a, 1b, proximal surface of holotype at two focus levels; 1c, intermediate focus level showing outline of rugulae.

Fig. 2, 3—*Rugulatisporites micraulaxus* n. sp. Figs. 2a, 2b, proximal and distal surfaces of paratype, × 750. Figs. 3a-3c, proximal, intermediate and distal focus levels of holotype, interference contrast.

Fig. 4—*Rugulatisporites trophus* n. sp. Figs. 4a, 4b, proximal and equatorial focus levels of holotype, interference contrast; 4c, distal surface, × 750.

Fig. 5—*Verrucosisporites crisatus* n. sp. Figs. 5a, 5b, proximal surface of holotype at two focus levels (specimens tilted), × 750.

Fig. 6—*Peromonolites vellosus* n. sp. Paratype at intermediate focus level.

Plate 16

Fig. 1—*Peromonolites vellosus* n. sp. Figs. 1a, 1b, oblique view of holotype at proximal and intermediate focus levels.

Fig. 2, 3—*Verrucosisporites kopukuensis* (Couper) n. comb. Figs. 2a, 2b, distal surface and portion of equatorial area of hypotype, × 325. Figs. 3a, 3b, distal surface and portion of proximal surface of another hypotype, × 325.

Fig. 4—*Polypodiaceoisporites tumulatus* n. sp. Figs. 4a, 4b, proximal and distal surfaces of holotype.

Fig. 5, 6—*Parvisaccites catastus* n. sp. Figs. 5a, 5b, holotype at two focus levels, × 750. Figs. 6a, 6b, portion of paratype at intermediate focus level ,and entire specimen showing tenuitas and sacci, × 750.

Fig. 7, 8—*Liliacidites bainii* n. sp. Figs. 7a, 7b, paratype at two focus levels; 7c, same focus level as 7a in phase contrast. Figs. 8a, 8b, holotype at two focus levels.

Fig. 9, 10—*Liliacidites lanceolatus* n. sp. Fig. 9a, ventral view of holotype; 9b, same in phase contrast. Fig. 10a, paratype; 10b, same in phase contrast.

Plate 17

Fig. 1, 2—*Dryptopollenites semilunatus* n. gen., n. sp. Figs. 1a, 1b, holotype at two focus levels. Fig. 2, paratype.

Fig. 3—*Tricolpites confessus* n. sp. Fig. 3a, holotype; 3b, same in phase contrast.

Fig. 4, 5—*Tricolpites incisus* n. sp. Fig. 4a, holotype in phase contrast; 4b, 4c, same specimen-opposite surface from Fig. 4a and at intermediate focus level. Fig. 5, paratype in phase contrast.

Fig. 6, 7—*Tricolpites phillipsii* n. sp. Fig. 6, holotype in phase contrast. Fig. 7a, paratype; 7b, same in phase contrast.

Fig. 8-11—*Tricolpites simatus* n. sp. Figs. 8a, 8b, holotype at high and intermediate focus levels. Figs. 9-11, paratypes.

Fig. 12—*Tricolpites thomasii* Cookson & Pike 1954. Figs 12a-12c, lectotype at three focus levels.

FIG. 13-16—*Gothanipollis bassensis* n. sp. Figs. 13a, holotype; 13b, same in phase contrast. Figs 14-16, paratypes.

FIG. 17-19—*Myrtaceidites verrucosus* n. sp. Figs. 17a, 17b, holotypes at two focus levels. Figs. 18, 19, paratypes.

FIG. 20—*Symplocoipollenites austellus* n. sp. Figs. 20a, 20b, holotype at two focus levels.

PLATE 18

FIG. 1, 2—*Concolpites leptos* n. gen., n. sp. Figs. 1a-1c, holotype at consecutive focus levels. Fig. 2, paratype.

FIG. 3, 4—*Schizocolpus marlinensis* n. gen., n. sp. Figs. 3a, 3b, holotype at high and intermediate focus levels; 3c, 3d, same in phase contrast. Figs. 4a, 4e, paratype shown at opposite polar surfaces; 4b-4d, same at consecutive focus levels in phase contrast, note ora at ends of colpi.

FIG. 5-7—*Tricolporites sphaerica* Cookson 1947. Figs. 5a-5e, neotype at consecutive focus levels. Figs. 6a-6c, topotype at three focus levels. Figs. 7a, 7b, another topotype in polar view at high and intermediate focus levels.

FIG. 8, 9—*Anisotricolporites triplaxis* n. gen., n. sp. Figs. 8a-8c, holotype at three focus levels, × 1000. Figs. 9a, 9b, paratype at two focus levels, × 1000; note that copli occur on one hemisphere only.

FIG. 10—*Tricolporites angurium* n. sp. Figs. 10b-10d, holotype at three focus levels; 10a, portion of reticulation in phase contrast.

FIG. 11, 12—*Tubulifloridites antipodica* Cookson 1947. Fig. 11, equatorial view of hypotype. Figs. 12a, 12b, polar view of another hypotype at two focus levels.

PLATE 19

FIG. 1—*Tricolporites paenestriatus* n. sp. Figs. 1a, 1b, holotype at two focus levels; 1c, same in phase contrast.

FIG. 2—*Tricolporites scabratus* Harris 1965. Figs. 2a, 2b, hypotype in phase contrast; 2c, same at intermediate focus level.

FIG. 3—*Bombacacidites bombaxoides* Couper 1960. Hypotype.

FIG. 4—*Gemmatricolporites gestus* n. sp. Fig. 4a, polar surface of holotype; 4b, 4c, same in interference contrast at two focus levels, × 500.

FIG. 5-7—*Tricolporites leuros* n. sp. Figs. 5a, 5b, paratype at high and intermediate focus levels. Figs. 6a, 6b, another paratype in equatorial view showing apertures. Figs. 7a, 7b, holotype at high and intermediate focus levels.

FIG. 8, 9—*Tricolporites retequetrus* n. sp. Figs. 8a-8c, holotype (tetrad) at consecutive focus levels ×500. Figs. 9a-9c, paratype at high, intermediate and low focus levels.

PLATE 20

FIG. 1, 2—*Tetracolporites verrucosus* n. sp. Figs. 1a, 1b, polar view of paratype. Figs. 2a, 2b, opposite surfaces of holotype.

FIG. 3-6—*Psilastephanocolporites micus* n. sp. Figs. 3a-3c, three focus levels of holotype from pole to equator. Figs. 4a, 4b, equatorial view of holotype. Figs. 5a, 5b, polar surface of another paratype in phase contrast; 5c, same specimen, focus near equator. Fig. 6, another paratype.

FIG. 7—*Polycolpites reticulatus* Couper 1960. Fig. 7a, hypotype; 7b, same in phase contrast.

FIG. 8, 9—*Aglaoreidia qualumis* n. sp. Figs. 8a-8c, holotype at distal, equatorial and proximal focus levels. Fig. 9, paratype in lateral view.

FIG. 10, 11—*Polycolpites esobalteus* McIntyre 1968. Fig. 10, hypotype; polar view. Fig. 11a, oblique lateral view of another hypotype; 11b, opposite surface of same specimen phase contrast.

FIG. 12—*Polycolpites langstonii* n. sp. Figs. 12a, 12b, holotype at two focus levels.

FIG. 13—*Sapotaceodaepollenites rotundus* Harris 1972. Figs. 13a, 13b, hypotype, equatorial view.

PLATE 21

FIG. 1—*Granodiporites nebulosus* n. sp. Figs. 1b, 1c, holotype at high and intermediate focus levels; 1a, portion of surface in phase contrast.

FIG. 2-4—*Banksieaeidites arcuatus* n. sp. Figs. 2a, 2b, holotype in phase contrast; 2c, same at intermediate focus level. Fig. 3, paratype. Fig. 4, another paratype.

FIG. 5—*Triporopollenites sectilis* n. sp. Figs. 5a, 5b, holotype at high and intermediate focus levels.

FIG. 6—*Triporopollenites chnosus* n. sp. Figs. 6a, 6b, holotype at high and intermediate focus levels.

FIG. 7—*Triporopollenites ambiguus* n. sp. Figs. 7a, 7b, holotype at high and intermediate focus levels.

FIG. 8—*Gambierina rudata* n. sp. Figs. 8a, 8b, holotype at high and intermediate focus levels.

FIG. 9—*Gambierina edwardsii* (Cookson & Pike) Harris 1972. Lectotype.

FIG. 10, 11—*Milfordia homeopunctata* (McIntyre) n. comb. Fig. 10, hypotype, ulcate specimen. Fig. 11, another hypotype, porate specimen.

PLATE 22

FIG. 1, 2—*Proteacidites alveolatus* n. sp. Figs. 1a, 1b, holotype at high and intermediate focus levels; 1c, same in interference contrast. Fig. 2, paratype.
FIG. 3, 4—*Proteacidites beddoesii* n. sp. Fig. 3a, paratype; 3b, same in phase contrast at high focus level showing apiculae. Fig. 4a, holotype; 4b, same in phase contrast.
FIG. 5, 6—*Proteacidites angulatus* n. sp. Figs. 5a, 5b, paratype at high and intermediate focus levels. Figs. 6a-6c, holotype at high, intermediate and low focus levels.
FIG. 7, 8—*Proteacidites adenanthoides* Cookson 1950. Figs. 7a, 7b, lectotype at high and intermediate focus levels, × 500. 8a, 8b, hypotype at two focus levels, × 750.
FIG. 9—*Proteacidites crassus* Cookson 1950. Fig. 9c, lectotype, × 500. 9a, detail of portion of polar surface; 9b, detail of portion of equatorial margin, × 500.

PLATE 23

FIG. 1, 2—*Proteacidites leightonii* n. sp. Figs. 1a-1c, holotype at three focus levels, × 750. Fig. 2, portion of paratype showing columellae, × 1000.
FIG. 3—*Proteacidites grandis* Cookson 1950. Lectotype in interference contrast, × 325.
FIG. 4, 5—*Proteacidites reticulatus* Cookson 1950. Fig. 4, neotype, × 750. Figs. 5a-5c, hypotype at three focus levels.
FIG. 6-8—*Proteacidites rectomarginis* Cookson 1950. Figs. 6a, 6b, portion of hypotype at high and intermediate focus levels. Fig. 7a, 7b, apertural area of another hypotype, sexine lacking. Fig. 8, another hypotype, × 750.

PLATE 24

FIG. 1—*Proteacidites tuberculatus* Cookson 1950. Figs. 1b, 1c, high and low focus levels of hypotype; 1a, portion of same at intermediate focus level, × 750.
FIG. 2, 3—*Proteacidites stipplatus* n. sp. Fig. 2a, paratype; 2b, portion of same in interference contrast. Figs. 3a, 3b, holotype at high and intermediate focus levels, × 750.
FIG. 4, 5—*Proteacidites recavus* n. sp. Fig. 4, paratype, × 750. Figs. 5a-5c, holotype at high, intermediate and low focus levels, × 750.
FIG. 6—*Proteacidites reflexus* n. sp. Fig. 6b, holotype, × 750; 6a portion of same in phase contrast, × 800.

PLATE 25

FIG. 1, 2—*Proteacidites symphyonemoides* Cookson 1950. Figs. 1a-1c, lectotype at three focus levels. Figs. 2a, 2b, hypotype at high and intermediate focus levels.
FIG. 3—*Proteacidites pseudomoides* n. sp. Figs. 3a, 3b, holotype at two focus levels; 3c, same in phase contrast.
FIG. 4—*Proteacidites obscurus* Cookson 1950. Figs. 4a, 4b, hypotype at two focus levels.
FIG. 5—*Proteacidites latrobensis* Harris 1966. Fig. 5b, hypotype; 5a, same in phase contrast.
FIG. 6, 7—*Proteacidites tenuiexinus* n. sp. Fig. 6, paratype in phase contrast. Figs. 7a, 7b, holotype at high and intermediate focus levels; 7c, same in phase contrast.
FIG. 8—*Proteacidites incurvatus* Cookson 1950. Figs. 8a, 8b, lectotype at high and intermediate focus levels in interference contrast, × 325.
FIG. 9—*Triorites magnificus* Cookson 1950. Fig. 9b, hypotype at high focus; 9 a, portion of same at intermediate focus level, × 750.

PLATE 26

FIG. 1—*Proteacidites pachypolus* Cookson & Pike 1954. Figs. 1a, 1b, portion of lectotype at two focus levels; 1c, same at intermediate focus level.
FIG. 2—*Proteacidites asperopolus* Stover & Evans 1973. Topotype.
FIG. 3-5—*Helciporites astrus* n. gen., n. sp. Figs. 3a, 3b, holotype at high and intermediate focus levels. Figs. 4a, 4b, equatorial views of paratype. Fig. 5, another paratype.
FIG. 6—*Malvacipollis diversus* Harris 1965. Figs. 6a, 6b, hypotype at two focus levels.
FIG. 7-9—*Malvacipollis subtilis* n. sp. Fig. 7, paratype. Figs. 8a, 8b, another paratype showing apertures. Figs. 9a-9c, holotype at three focus levels.
FIG. 10, 11—*Periporopollenites demarcatus* n. sp. Figs. 10a-10c, paratype at three focus levels; 10d, portion of same in phase contrast. Figs. 11c, 11d, holotype at high and intermediate focus levels; 11a, 11b, portion of same in phase contrast.
FIG. 12—*Periporopollenites vesicus* n. sp. Figs. 12a-12c, holotype at high, intermediate and low focus levels.

PLATE 27

FIG. 1—*Anacolosidites acutullus* Cookson & Pike 1954. Figs. 1a-1c, lectotype at three focus levels.
FIG. 2, 3—*Haloragacidites amolosus* n. sp. Figs. 2a, 2b, holotype at two focus levels. Fig. 3, paratype.
FIG. 4, 5—*Haloragacidites haloragoides* Cookson & Pike 1954. Fig. 4, hypotype. Figs. 5a, 5b, equatorial views of another hypotype.

FIG. 6—*Anacolosidites luteoides* Cookson & Pike 1954. Figs. 6a, 6b, hypotype at high and intermediate focus levels.
FIG. 7, 8—*Anacolosidites sectus* n. sp. Fig. 7, holotype. Fig. 8, paratype.
FIG. 9, 10—*Triporopollenites bellus.* n. sp. Figs. 9a-9c, holotype at three focus levels. Figs. 10a, 10b, paratype at high and intermediate focus levels.
FIG. 11—*Polyadopollenites myriosporites* (Cookson) n. comb. Hypotype, × 750.
FIG. 12-15—*Quadraplanus brossus* n. gen., n. sp. Fig. 12, paratype. Figs. 13a, 13b, holotype at high and intermediate focus levels. Fig. 14, another paratype lacking sexine. Fig. 15, another paratype.

PLATE 28

FIG. 1—*Bysmapollis emaciatus* n. gen., n. sp. Figs. 1a-1c, holotype at three focus levels.
FIG. 2—*Paripollis ochesis* n. gen., n. sp. Figs. 2a-2c, holotype at three focus levels.
FIG. 3—*Gephyrapollenites calathus* n. sp. Figs. 3a-3c, holotype at three focus levels.
FIG. 4-6—*Gephyrapollenites wahooensis* n. sp. Figs. 4a, 4b, holotype at high and intermediate focus levels. Figs. 5a, 5b, paratype as above. Figs. 6a, 6b, another paratype as above.
FIG. 7—*Gephyrapollenites cranwellae* n. gen., n. sp. Figs. 7a-7c, holotype at high, intermediate and low focus levels; 7d, same in interference contrast.